# TRANSACTIONS

AND

# YEAR BOOK


UNIVERSITY OF TORONTO
ENGINEERING SOCIETY

APRIL, 1935

Vol. No. 98.

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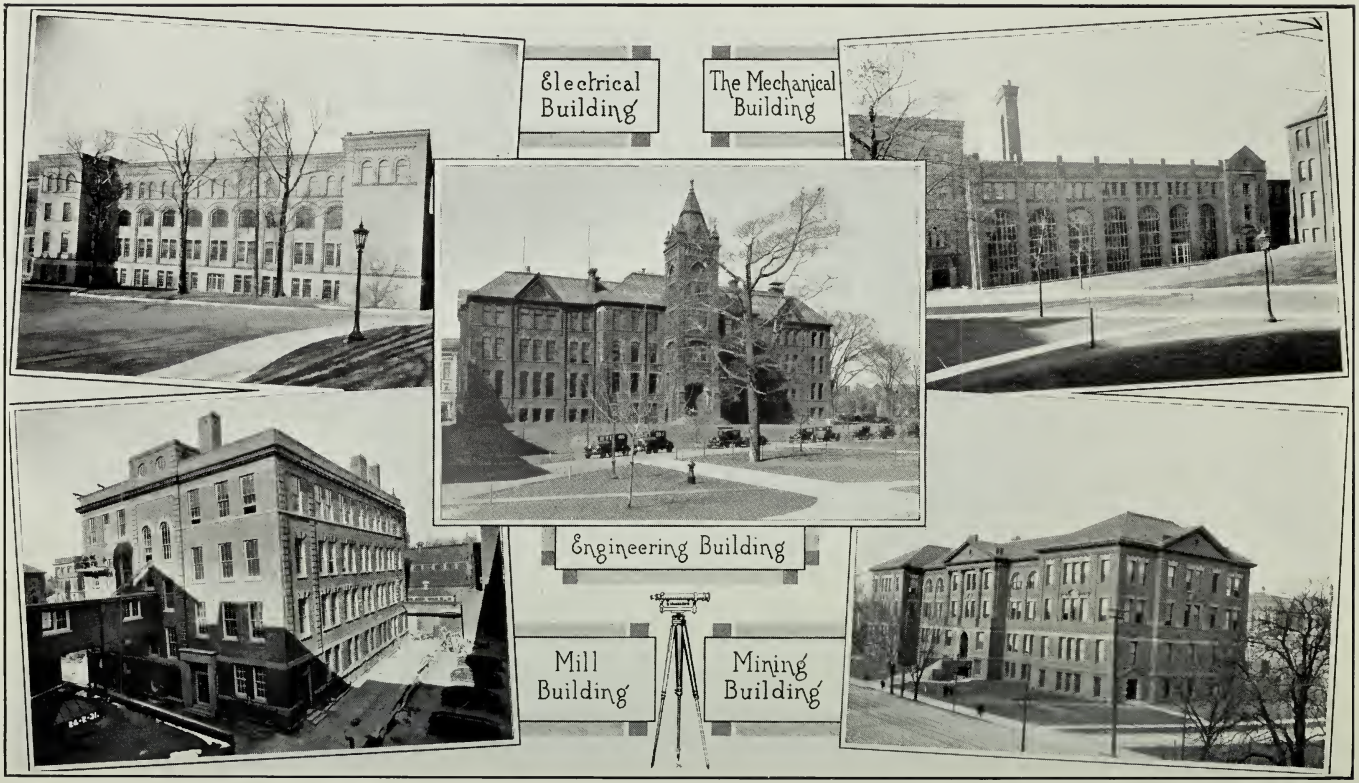
Electrical Building
The Mechanical Building
Engineering Building
Mill Building
Mining Building

# CONTENTS

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1934 1935

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# TRANSACTIONS AND YEAR BOOK

*of the*

# University of Toronto Engineering Society

No. 48 APRIL, 1935



## Editorial

ONCE again it is the pleasure of the Board of Editors, on behalf of the University of Toronto Engineering Society, to present this, the current issue of TRANSACTIONS AND YEAR BOOK. In doing so it is our earnest desire that the more technical portions may prove both interesting and instructive and that the Year Book may serve as a permanent record of the year's activities which, on perusal in the future, may recall many pleasant memories. Thus we give you TRANSACTIONS.

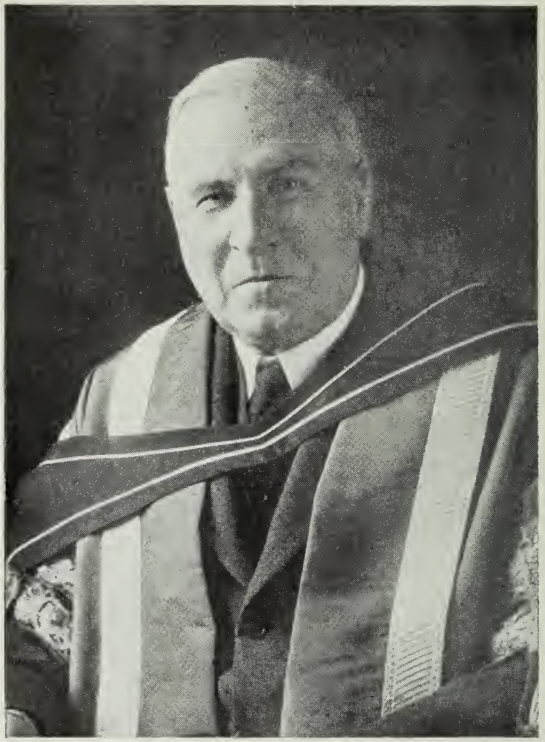
In this edition the Board has seen fit to follow the policy of previous years insofar as the general form is concerned. The first section of the book is composed of all the papers presented at the regular meetings of the Engineering Society. An attempt has been made throughout to publish these verbatim, but due to lack of space it was unfortunately necessary to condense portions of some of the articles. To the authors we offer our sincere regrets.

We count ourselves fortunate in obtaining, to complete the technical section, an article by Prof. H. E. T. Haultain, Professor of Mining Engineering, and two theses written by graduating students of this Faculty. In our opinion these will prove of vital interest to all graduates of School—past, present and future.

In the Year Book we have tried to present "School" as it really is and it is our hope that this section may serve as a fitting tribute to the eminently successful year of 1934-5.

In closing may we express our appreciation to our advertisers, who have remained with us despite the current monetary difficulties; to members of the Faculty Staff who have lent their hearty co-operation; and to all others who have contributed in any way to making this volume possible.

"BALL OF FIRE."



THE HON. AND REV. H. J. CODY, M.A., D.D., LL.D.
President of the University of Toronto

# Message from President Cody

I am glad to add a personal message, as you issue the TRANSACTIONS AND YEAR BOOK of your Society. In no Faculty or Department of the University is there a stronger spirit of unity, and of loyalty both to your Faculty and to the University as a whole, then in the Faculty of Applied Science and Engineering.

Your Society has rendered good service during the year in promoting the social welfare of your members and in supplementing their work in lecture-room and laboratory. On the academic side there have been several important changes and developments in your course. The School of Architecture has been brought into still closer touch with the profession by the addition to the staff of such well-known architects as Mr. A. S. Mathers and Mr. A. E. Burden—both old graduates of the School. The new course in Engineering Physics will help to meet the requirements of the future which will demand of the engineer that he be at once engineer, mathematician and physicist.

The accommodation for the students in Chemical Engineering has been to the utmost. As soon as it can be managed, more accommodation, we hope, will be supplied. There is every indication that there will be a continued demand for the well-known chemist and chemical engineer. Indeed the general outlook for the engineer in Canada seems favourable. There is an increasing accumulation of deferred private developments which will be taken in hand when times improve. The great northland has only been touched, and reviving industry will call for a growing body of scientifically-trained workers and leaders.

There is no better training for useful citizenship than that which your course supplies. Accuracy, thoroughness, integrity, perseverance—the hall-marks of your profession—are needed in every field of life. More people fail through defect of character than through lack of knowledge.

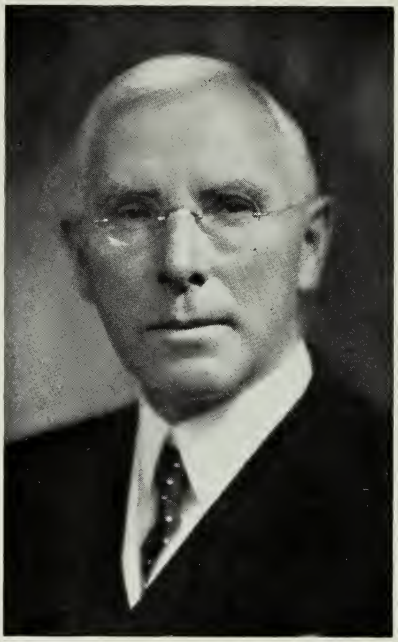
Do not fail to remember that you are human beings as well as Engineers. You would fain be both well-trained and well-educated in the broadest sense of the term. One of the great advantages which accrues from the placing of a Faculty of Engineering in a University is that your strictly professional training is carried on in the atmosphere of broad and liberal culture.

I hope that most, if not all, of you will find suitable positions for the coming summer months.

My thanks and best wishes go with you.

H J Cody

# The Dean's Message for 1935



To the Members of the Engineering Society:

*Gentlemen.*

Again the year has had its outstanding features in the Engineering Society, as well as in the Faculty generally. It has been a year full of interest and will be looked back upon as a year with special character distinguishing it from others.

The Engineering Society has had a remarkably successful year with meetings, social functions and business accomplishments, which have produced renewed interest in the affairs of the Society and the student body. These have brought to the front many of its members, officers and others who have taken leading parts in the activities of the Society and its Clubs. It is this kind of experience and activity which especially prepares graduates of this Faculty to take their places as leading citizens when they go out into the world.

A year ago we were approaching "the corner" in the turning process that would take us out of the depression with which we have been struggling the past few years. We can now say definitely that we are actually turning the corner. True, the curve is of a long

radius, but I fancy it will prove to be a compound curve with the radii decreasing as we travel it in the next year or so. Then, when we get around and straightened out on the new tangent, we will all see new life ahead of us in Canada.

The "Long Road" that we have been travelling has brought us to a new lookout on the hillside. We are now at a place where we can not only look back on the way we have come, but see something of what is ahead. True, we cannot yet see much of what is around the turn or over the top of the hill. But let us all, whether going out as graduates or remaining here, keep our courage up with the prospect that we know is ahead. At any rate, the views from where we now stand look attractive and encouraging. Let us all be patient, continue our hard work and keep our heads and exercise our good common sense, and we will have nothing to fear, especially when we are in the splendid professions of Engineering and Architecture.

Whatever may be in front of us, we surely can go on with light hearts and enthusiasm, ready for anything this young and growing country may require of us.

"Give me the open road
And the life that is good and free,
And I'll march along with a happy song
Whatever the weather may be."

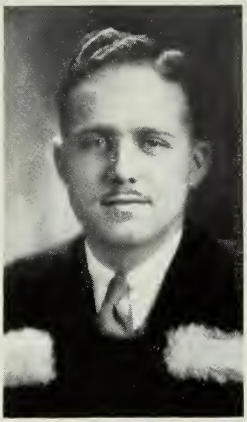
With best wishes for good fortune and success for all of you.

Yours faithfully,

C. H. Mitchell,

March, 1935. *Dean.*

# President's Message



SCHOOLMEN:

Our Engineering Society has this year terminated one of the most successful years in its history. The keenness of our members, the marvellous genius for organization and carrying out of plans has again been the envy of every similar Faculty group on the campus, and, indeed, even of other universities. Much of the credit for this is due to the efforts of our predecessors in laying such firm foundations, but we may be justly proud that our work this year has, if anything, added to the already long list of Engineering Society achievements.

A review of the chief activities of the School would seem to be appropriate at this point to support the claims made above. However, a mere mention of an event cannot begin to describe the true picture, but, fortunately, as everything was so well attended by Schoolmen, this alone will probably recall the many pleasant occasions and all that they mean.

Long before the start of the session, the Engineering Society was a hive of activity, as under the guidance of the hard-working Bob McIntyre and the very able Miss Bradshaw, the supplies for our store were received and made ready for the advent of our members. The results of their efforts are shown in the annual financial statement and speak for themselves.

The 45th Annual School Dinner on Tuesday, November 20th, was a record breaker for decorations, entertainment, shortness of toasts, and excellence of the main speaker. Schoolmen gathered in even greater numbers than could be accommodated to enjoy the best food that Hart House could provide, and thoroughly appreciated the very appropriate remarks of the Hon. Vincent Massey. It is difficult to single any one man out for praise in this connection as every member of the committee gave himself untiringly to make the dinner a success, and every Schoolman seemed to want to lend his support.

There is little need to mention the super-excellence of School Nite as this event has gone down in history as the greatest ever. The small subsidy granted the committee this year just seemed to make all the difference in the world. The vision presented on that evening of five orchestras, decorations, food, waterpolo, diving, and the new departure, the "Revue" in the theatre, hardly allows one's imagination to ever hope for a possible improvement in our informal extravaganza. Bob Hewitt, as chairman, and Harry McQuire, in

charge of the "Revue", were chiefly responsible for this enjoyable function, but again, it is difficult to single out any one for special praise.

The School Formal proved that a bit of forethought in the planning of activities was a good thing. With all the other faculties cancelling their formal dances, the Engineering Society rearranged its programme and held a most enjoyable dance at popular prices, and, believe it or not, made a small profit. This was quite a radical departure from tradition. However, in these troubled times, it was much better to be able to place a small profit in the treasury than pay out a possible $300 deficit.

The general meetings of the Society were, on the whole, well attended. Although economics seemed to meet with little favour the majority of the papers and addresses were well worth hearing from both an engineering and general knowledge standpoint. The Club Chairmen co-operated most ably with your President in obtaining speakers, and made it relatively simple to hold an open meeting every two weeks.

The School elections were as noisy and exciting as ever. Gray Farrar kept a watchful eye on the proceedings and controlled everything most efficiently.

The School publications in the form of the Toike Oike and the TRANSACTIONS have been most ably managed in every department. Our Director of Publications, Mr. Frank McCarthy, and his editors, Pete Johnson and Bruce (Ball of Fire) Edward may well feel proud of their editions. TRANSACTIONS' advertisements have been given a further increase by the excellent salesmanship of Wilf Cook and George Mills. Frank McCarthy's advertising of meetings and sing-song leadership is also worthy of mention.

Although few realize the responsibilities of the Treasurer, the many tasks allotted to him have been well handled. It was not uncommon during the year to see Bill Lawrason working long after 5 p.m. to strike a balance and keep our accounts up to date.

Every Club has shown an increased activity this year, and has shown that their interests form a vital part of our education here. The Chairman of each Club is to be congratulated on the results of his efforts.

The Athletic Association, with Bob Webber at the helm, has shown a remarkable improvement in organization. Many new ways of handling equipment more economically and of keeping records have been introduced, and this increased efficiency makes itself evident in the balance sheet, and in the attitude of the Faculty towards its executive. Furthermore, the prestige of School in Interfaculty sport has been well upheld, and our fair share of championships have been well won.

Few Presidents of this Society have been as fortunate as I, in having an Executive whose members took such delight in assuming responsibilities and fulfilling them most creditably. These sterling, stout-hearted men, and all Schoolmen that have worked so hard to make School functions successful, have my sincere thanks. Many of our professors and other members of the Faculty, notably Dean

Mitchell, Professor Treadgold, Professor Wright, and Mr. Wardell, have also contributed in no small way to the success of the Society, and their advice and co-operation have been gratefully appreciated.

Schoolmen, words cannot express what it has meant to me to have had the honour and pleasure of being your President. I can only hope that I have been able to lead, as you yourself would have, in the same position. To Bill Lawrason, your new President, and his Executive, I extend hearty congratulations and best of luck for future success.

D. G. Ritchie.

1935

# TRANSACTIONS

OF THE

## UNIVERSITY OF TORONTO ENGINEERING SOCIETY


FACULTY OF APPLIED SCIENCE
AND ENGINEERING

UNIVERSITY OF TORONTO

# Summer Air Conditioning

*Condensed from a thesis for the degree of B.A.Sc. in Civil Engineering*

BY D. B. THOMAS

## PART I

### Thermodynamics of Air Conditioning

In this age of high efficiency it is necessary to provide good living conditions for satisfactory work. Air conditioning has become so common in the theatres that it is essential that the buildings be adequately equipped to keep up with the times. Here sales propaganda greatly aids the advancement of air conditioning. The general public is realizing that it is not necessary to endure warm, stuffy room conditions.

*Human Comfort*

The psychological reaction of human beings is one of the difficult problems for the air conditioning engineer. In the new Metropolitan office building in New York, a complete summer air conditioning system was installed, and windows were locked to keep the system balanced. Some of the inhabitants declared they could not stand the close air, whereas the air was actually perfectly conditioned. Once the general public has been convinced, air conditioning will become a necessity and not a luxury. People originally had the idea that decreased oxygen and increased $CO_2$ content caused a densely populated and poorly ventilated room to be stuffy. Tests were made with several men in a small closed room, equipped with tubes so that they could breathe outside air. In the first case, the room was closed and allowed to become stuffy. No relief was obtained by allowing the men to breathe conditioned air. In the second case, the room conditions were kept perfect, and they breathed impure air. This produced practically no discomfort to the subjects. Therefore it is something other than breathing conditioned air which is necessary for human comfort. Research has proven that the body must give off a certain amount of heat by convection, evaporation, or breathed air, and any prevention of this causes discomfort. Convection and evaporation are of major importance, thus explaining the results of the above tests. The human body has a remarkable heat regulation system. For persons at rest the heat emission, and hence the body temperature is practically constant for effective temperature of 66° to 86°.

*Synthetic Chart*

The A.S.H.V.E. has adopted the "Synthetic Air Chart" (see fig. 1) to determine the percentage of perfect ventilation. This is done by plotting test data for all known factors which make up the

air condition. These factors, with their proper weights, are arranged in vertical columns across the chart. The base of each column represents perfection. Six factors are chosen, and the value of imperfection of each is plotted. The per cent. imperfection (given in the outside columns) of each factor is used to obtain the per cent. of perfect ventilation. The factors are as follows:—

A. *The effective temperature difference*,—or the amount of variation of the actual effective temperature from the ideal effective temperature of 71°. Effective temperature is a study within itself, and will be briefly described later.

B. *Dust particles per cubic foot.*—The scale of the chart reads directly in thousands of dust particles per cubic foot as recorded by a dust collector.

C. *Bacteria colonies formed in two minutes.*—Standard culture plates are exposed to the air for two minutes, and then incubated. The colonies that develop are counted and recorded.

D. *Per cent. free from odours.*—This value is determined by an approximate test. The observer goes out of the room and breathes outside air for a short time, then quickly returns and breathes the air in the room being tested. He selects what he considers as the value for the room from the following percentages.

Freedom from odours

| | |
|---|---|
| 100% = perfect | 85% = noticeable |
| 95% = very faint | 80% = distinct |
| 90% = faint | 75% = decided |
| | 70% = strong. |

E. *Parts of $CO_2$ per 10,000 parts of air.*—Carbon dioxide is not harmful in ordinary concentration but is an indication of the vitiation and distribution of the air. The Petterson-Palmquist apparatus is commonly used. A sample of air of given volume is taken, run through caustic potash, and the $CO_2$ absorbed. The volume is again measured, at the same pressure, and the parts per ten thousand calculated.

F. *Per cent of distribution.*—The distribution of the air in the room is determined from the $CO_2$ analysis taken at various stations. The following example illustrates the method of calculation:

| *Stations* | $CO_2$ | *Variations from average* |
|---|---|---|
| 1 | 11.1 | 11.1 − 10.2 = .9 |
| 2 | 9.4 | 10.2 − 9.4 = .8 |
| 3 | 10.4 | 10.4 − 10.2 = .2 |
| 4 | 9.9 | 10.2 − 9.9 = .3 |
| Total | 40.8 | Total 2.2 |
| Average | 10.2 | Average .55 |

$$\text{Per cent. of variation} = \frac{.55 \times 100}{10.2} = 5.4$$

Final per cent. of distribution = 100 − 5.4 = 94.6%.

Figure 1 is worked out for the following test results.

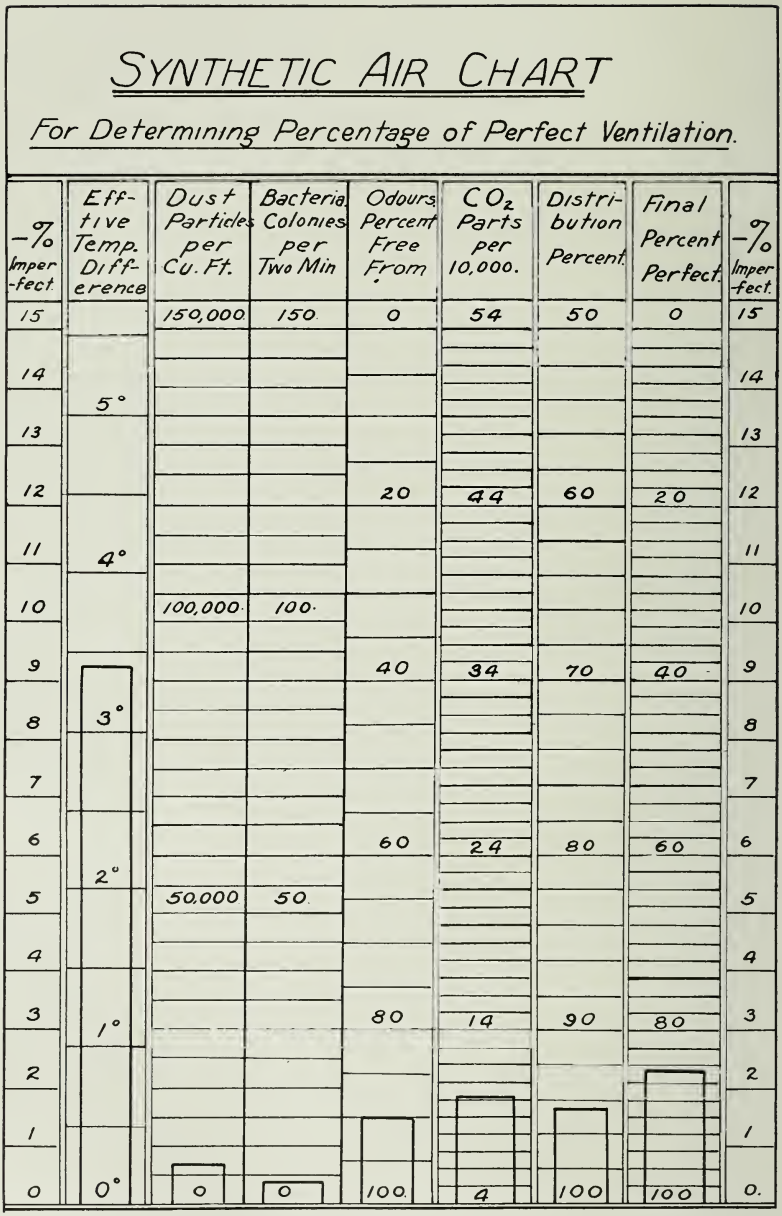

SYNTHETIC AIR CHART
For Determining Percentage of Perfect Ventilation.
% Imperfect
Effective Temp. Difference
Dust Particles per Cu. Ft.
Bacteria Colonies per Two Min
Odours Percent Free From
$CO_2$ Parts per 10,000.
Distribution Percent
Final Percent Perfect
% Imperfect
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
5°
4°
3°
2°
1°
0°
150,000
100,000
50,000
0
150
100
50
0
0
20
40
60
80
100
54
44
34
24
14
4
50
60
70
80
90
100
0
20
40
60
80
100

Fig. 1

| *Column* | *Value* | *Per cent. imperfect* |
|---|---|---|
| A | Effective temperature difference (3.4°) | 9.2% |
| B | Dust (7,000 parts per cubic foot) | .75% |
| C | Bacteria (3.8 colonies) | .40% |
| D | Odours (faint = 90%) | 1.5% |
| E | $CO_2$ (10.2 parts per 10,000) | 1.9% |
| F | Distribution (94.6%) | 1.7% |
| | Total | 15.45% |

Therefore, per cent. perfect = 100 − 15.45 = 84.55%.

*Psychrometric Chart*

Very little work in air conditioning can be done without a thorough understanding of the terms of the psychrometric chart. It takes into account not only the air temperature, its wet bulb temperature, dew point, and relative humidity, but also the weight of the air, its volume, pressure, water vapour content and pressure, and the total heat content.

Figure 2 is a condensed copy of the E. V. Hill psychrometric chart. It readily divides itself into three distinct parts; and if factors of any two are known, the third is obtainable by using the curves on the chart.

First consider the dry bulb temperature. Since the chart is constructed for a constant atmospheric pressure, the volume of the air is a direct function of the dry bulb temperature as shown by Dalton's Laws:—

(1) The pressure and consequently the quantity of vapour which saturates a given space are the same, for the same temperature, whether this space contains a gas or a vacuum.

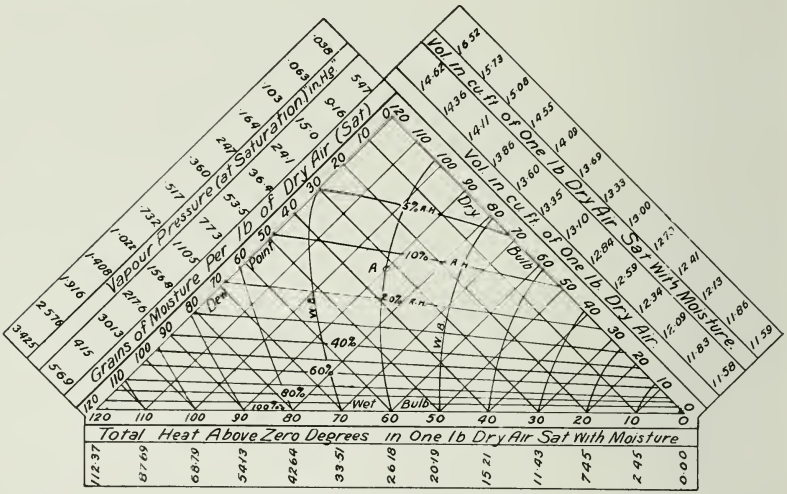
(2) The pressure of the mixture of a gas and a vapour is equal to the sum of the pressures which each would exert if it occupied the same space alone.

One scale is for dry air containing no moisture, while the other scale is for saturated air. For a given temperature and pressure the volume of the air partially saturated at a given dry bulb temperature, is equal to the volume of the dry air plus a certain percentage of the increased volume of the saturated air.

Next, consider the section devoted to the wet bulb temperature, or the temperature at which evaporation takes place. The fundamental law is that the wet bulb temperature is constant when the total heat in the air is constant. Total heat is the sum of the sensible heat, or that required to raise the temperature of the gases, and latent heat, or the heat of evaporation. Opposite a given temperature, the scale reads the total heat above zero degrees Fahrenheit of one pound of dry air saturated with moisture. The term dry air saturated with moisture means that the air contains all the water vapour it can hold at that temperature, but has no suspended particles of condensed vapour.

The third section deals with the dew point temperature, or the temperature of condensation. Thus the dew point of unsaturated air is the temperature reached in cooling when condensation takes place. A fixed dew point means a fixed total moisture content or absolute humidity. The first scale gives the grains of moisture per pound of air under saturated conditions. The second scale gives the vapour pressure. This is the pressure in inches of mercury, exerted by the water vapour as explained in Dalton's second law. Thus a point on the chart represents a given condition of the atmosphere; and by following dry bulb, dew point and wet bulb lines, the respective properties of the air are directly obtained.

The remaining factor, given on the chart, is the relative humidity. It may be defined as the amount of moisture in the air expressed as a percentage of the total amount it could hold at that dry bulb temperature if the air were saturated. This value may be read from the chart or more accurately computed as in the following example:




PSYCHROMETRIC CHART

FIG. 2

It is required to find the relative humidity at a condition "A", shown on the chart, of 90° dry bulb, 32° dew point, and 60° wet bulb. The vapour pressure under this unsaturated condition is found opposite 32° dew point to be .18 inches of mercury. At saturation the dry bulb, dew point, and wet bulb temperatures are all equal. Then when saturated at 90°, the dew point is also 90°; and hence the vapour pressure is 1.408 inches of mercury. Dividing .18 by 1.408 gives 12.8%, or the relative humidity at the point "A".

*Effective Temperature*

It was found very difficult to express similar sensations of air conditions by the temperature given on the psychrometric chart.

The present solution is the effective temperature. It is defined as the arbitrary index of degree of warmth or cold felt by the human body in response to temperature, humidity, and air motion. The basis of comparison is saturated air with a velocity of 15 to 25 feet per minute (still air). Absolutely still air conditions are impossible, even in a closed room, on account of convection currents. Thus air having an effective temperature of 65° may have any combination of dry bulb, wet bulb, or air velocity condition which will produce a sensation of warmth equal to still saturated air at 65°.

Wet and dry bulb temperatures may be obtained by using a sling psychrometer. Two mercury thermometers are mounted so that they may be whirled around a handle. One thermometer records the dry bulb; while the other is covered with thin gauze and dampened so that it records the temperature of evaporation or wet bulb. Small air velocities may be measured quite accurately by means of the Kata thermometer. The time is taken on a stop watch for the fixed quantity of alcohol to cool from 100° to 95°F. By referring to tables the velocity is obtained.

*Determination of Inside Condition*

At present many air conditioning systems are run uneconomically because of the extreme requirements imposed. Consider for example a system which is operated to maintain a fixed condition of 74° dry bulb and 50% relative humidity. It will have an enormous load during the hot summer days, and will provide conditions which are too cool for the occupants who have been inside less than one or two hours. Recent research bulletins give the best inside dry bulb temperature as equal to the following:—

$$72°\text{F} + \tfrac{1}{3} \text{ (outside temperature } - 70°\text{F.)}$$

*Heat Transmission*

Once the inside and outside dry bulb temperature difference is determined, the problem remains to find the resulting heat transmission through the walls, roof and glass. Every material has a thermal conductivity "*k*"; and from its value the heat transmission of a wall is determined. The following definitions will best explain the use of the symbols in the formula.

"*k*" is thermal conductivity of a homogeneous material, or is the number of Btu transmitted through one square foot of the material one inch thick, in one hour, for one degree difference in surface temperature.

"*X*" is the thickness of the material or air space in inches.

"*C*" is the thermal conductance per hour of one square foot of non-homogeneous material of a given thickness, for a one degree difference in surface temperature. For a built-up section of several materials, the value of *C* is given in the following formula:

$$C = \frac{1}{\frac{x_1}{k_1} + \frac{x_2}{k_2} + \frac{x_3}{k_3}} \qquad (1)$$

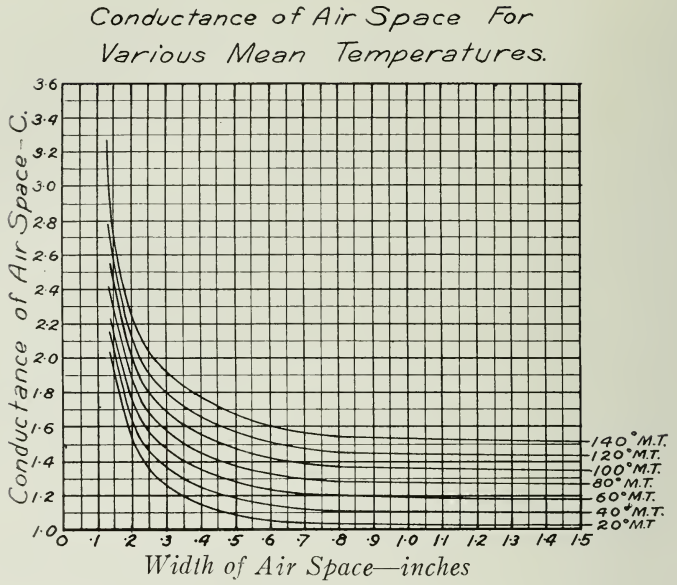

Conductance of Air Space For
Various Mean Temperatures.
Conductance of Air Space - C.
3·6
3·4
3·2
3·0
2·8
2·6
2·4
2·2
2·0
1·8
1·6
1·4
1·2
1·0
0 ·1 ·2 ·3 ·4 ·5 ·6 ·7 ·8 ·9 1·0 1·1 1·2 1·3 1·4 1·5
140° M.T.
120° M.T.
100° M.T.
80° M.T.
60° M.T.
40° M.T.
20° M.T.
Width of Air Space—inches

Fig. 3

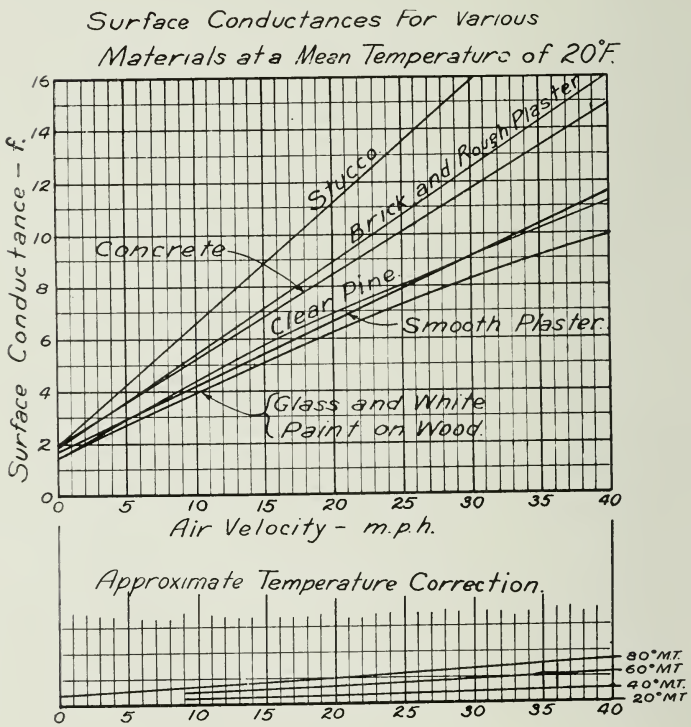

Surface Conductances For Various
Materials at a Mean Temperature of 20°F.
Surface Conductance - f.
16
14
12
10
8
6
4
2
0
Stucco
Brick and Rough Plaster
Concrete
Clear Pine
Smooth Plaster
Glass and White
Paint on Wood
0 5 10 15 20 25 30 35 40
Air Velocity - m.p.h.
Approximate Temperature Correction.
80° M.T.
60° M.T.
40° M.T.
20° M.T.
0 5 10 15 20 25 30 35 40

Fig. 4

For air spaces the value of "*C*" is affected by convection currents set up, and does not vary as the width of the air space. Recently established values of air space conductances for various mean temperatures are given in figure 3. The usual value for an air space of over .75" is 1.1. For cooling problems, this value should be increased to 1.3 since 1.1 is based on a mean temperature of 40°F.

"*F*" is the surface conductance, or is the number of Btu transmitted from the surface to the surrounding air per hour, per square foot, for one degree difference in temperature. The inside surface conductance is represented by *fi*, while the outside value is represented by *fo*. Usual accepted values of *fi* and *fo* are 1.65 and 6, respectively. The University of Minnesota has carried on tests on this subject for several years. The results are shown in figure 4. Values of *fi* are given at zero wind velocity and check closely with the usual value of 1.65. But for a stucco wall at a wind velocity of 15 m.p.h. the value of *fo* is 9. This value differs considerably from the usual value of 6 and would cause quite an error in the building calculations.

"*U*" is the thermal transmittance of one square foot of wall from inside air to outside air for one degree difference in air temperature. Therefore for any wall, roof, or floor, etc., *U* is given by its following formula:

$$U = \frac{1}{\frac{1}{fi}+\frac{1}{fo}+\frac{x_1}{k_1}+\frac{x_2}{k_2}+\frac{x_3}{k_3}} + \ldots . \qquad (2)$$

The total heat transmitted through a given area of material is given by the following formula:

$$Ht = A \times U \ (to\text{-}ti) \qquad (3)$$

where *Ht* is the Btu per hour transmitted through wall, roof, glass, etc.
*A* is the area of surface.
*U* is the coefficient of transmission.
(*to-ti*) is the difference between inside and outside temperatures.

## PART II

### Sun Effect

The principal factor in the cooling load is the sun effect on the walls, glass, and roof. It may account for as much as 75% of the cooling load. At the present time sun-load calculations are based on the following formula:

$$Q' = A.\ C' \ (ts\text{-}ti) \qquad (4)$$

where *Q'* is the Btu per hour due to the sun effect.
*A* is the area of the surface exposed.
*ts* is the temperature of the outside surface.
*ti* is the temperature of the inside air.
*C'* is the increased thermal conductance of the material.

This formula does not consider the orientation of the surface and its results cannot be relied upon.

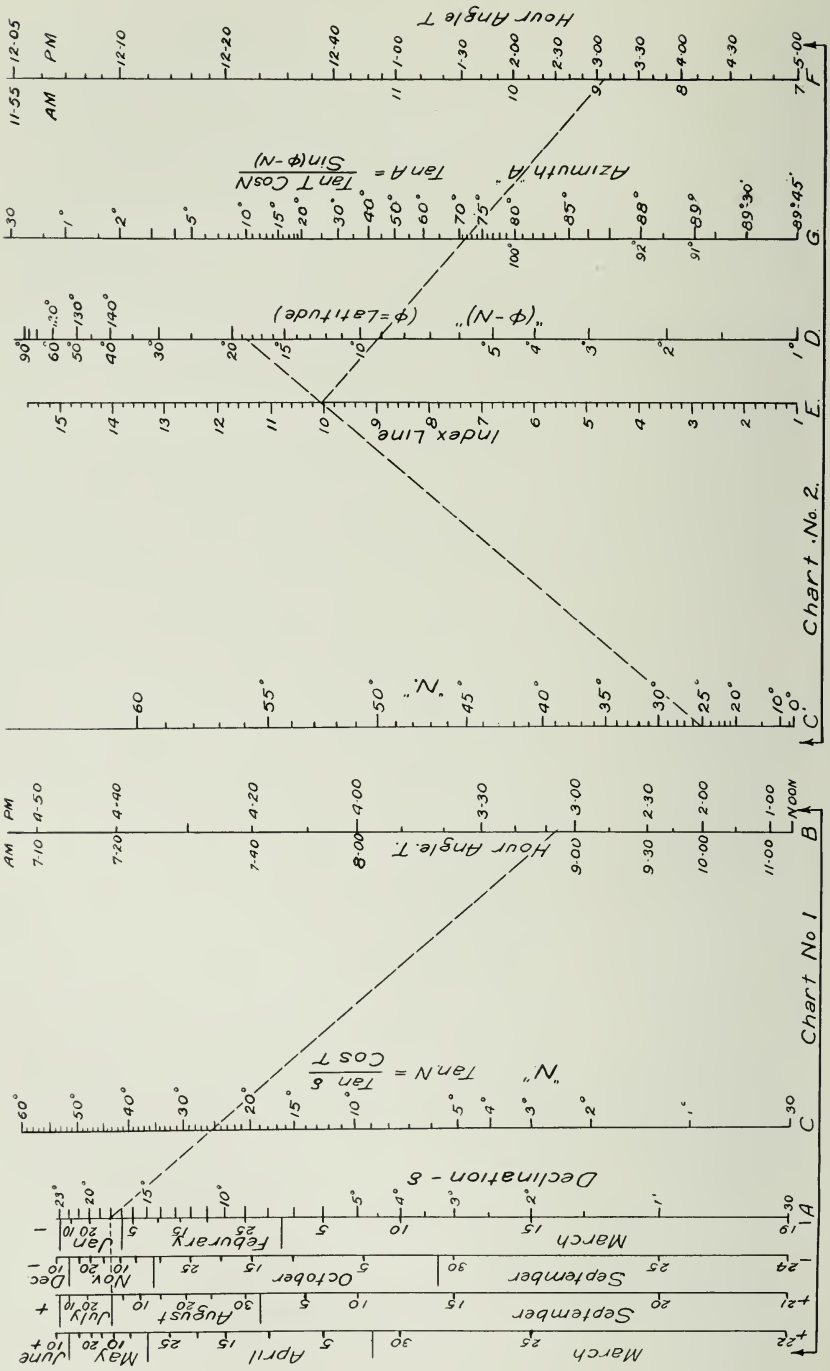



Fig. 5—Sun Location Chart.

A better method of solution is to treat the problem as one in radiant heat. Then sun-load is found as follows:

$$Q = Z.\ H_s \sin \theta \qquad (5)$$

where $Q$ is the Btu per hour absorbed by one sq. ft. of surface.
$Hs$ is the intensity of the sun normal to the ray expressed in Btu per hour.
$\theta$ is the angle between the wall and the sun's ray.
$Z$ is the absorption or transmission factor.

At the present time there is no available data connecting the absorbed heat and the outside surface temperature of the wall. Thus the value of $Z$ can only be found for transparent surfaces. However, the window load is usually over 55% of the sun-load and the problem is worthy of consideration.

"Solar transmission through glass" has been thoroughly investigated. In no case does glass transmit 100% of the incident energy, since approximately $4\frac{1}{2}$% is reflected from each surface. Tests were conducted, using various types and thicknesses of glass to find the per cent. of solar radiation transmitted for different angles of inclination of the sun on the surface. The results of the tests show that the transmission factor "$Z$", for ordinary glass with incident angles not greater than 45°, may be taken as .85. The value of the solar intensity $H_s$ normal to the sun may be obtained in the A.S.H.V.E. "Guide" for the sun time on August 1st. For accurate work, a graph would have to be plotted from readings on a pyrheliometer at the particular location.

The remaining factor "$\theta$" is the angle of the sun. In this connection the author submits,—(*a*) a sun location chart (figures 5 and 5a) which gives the azimuth of the sun measured east or west of the south line, and the altitude. (*b*) a second chart (Fig. 6), using the sun coordinates, and the solar intensity on a plane normal to the rays, which gives the resolved component normal to the vertical plane considered. This final value, when multiplied by the transmission factor, will give the required sun load per square foot.

*Development of the Sun Location Chart*

The sun location chart (figures 5 and 5a) is of the monogram type, and is based on the following equations:

$$(1)\ \tan A = \frac{\tan T \cos N}{\sin (\phi - N)} \qquad (6)$$

$$(2)\ \cot H = \frac{\tan (\phi - N)}{\cos A} \qquad (7)$$

where $A$ is the azimuth.
$H$ is the altitude.
$T$ is the hour angle as sun time.
$\phi$ is the latitude.
$N$ is the auxiliary angle found by $\tan N = \frac{\tan D}{\cos T}$ (8)
$D$ is the declination of the sun.

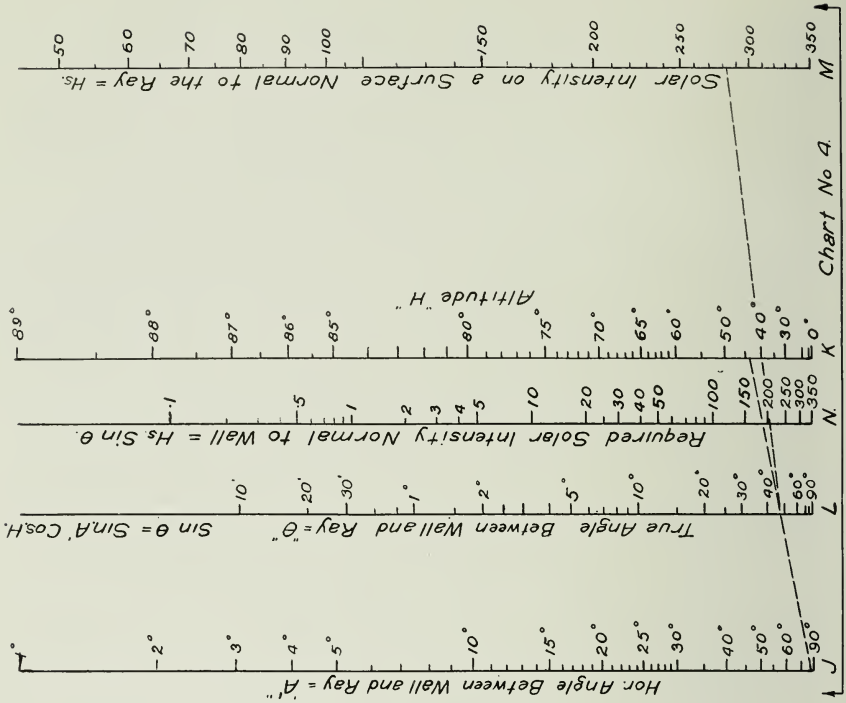



Fig. 6.—Sun Intensity Chart.

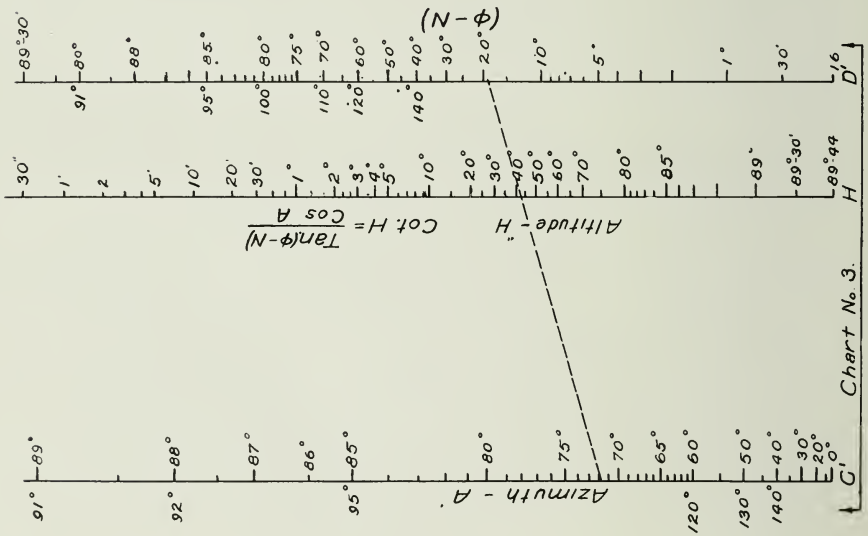



Fig. 5a

The declination of the sun varies in cycles over a period of four years, and the average value is plotted. It has a negative value from September 21st to March 21st and a positive value from March 21st to September 21st. Eastern standard time is the mean time at the 75th meridian; and is therefore a function of the sun time and the equation of time. Mean values of equation of time are given for various days of year in figure 7. By applying the following formula, the sun time or hour angle is found:

$$S = M + E + L \qquad (9)$$

where $S$ is the sun time.
$M$ is the mean standard time.
$E$ is the equation of time.
$L$ is the longitude correction.

$$= \left\{ \frac{\text{degree of longitude from time meridian}}{15} \right\} \text{ hours.}$$

If standard time meridian is east of the place, then $L$ is negative, and vice versa.

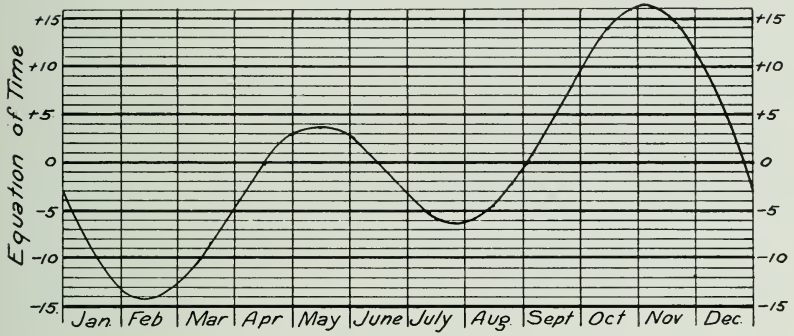



Fig. 7

*Development of the Sun Intensity Chart*

The sun intensity chart is also of the monogram type, and is a graphical solution of the last two terms ($H_s \sin \theta$) of formula 5. The azimuth obtained in chart No. 2 is used to obtain $A'$, the horizontal angle between the ray and the vertical surface considered (see fig. 8). Then the horizontal angle $A'$ and the vertical angle $H$ give the required angle $\theta$ (see fig. 9) since

$$\sin \theta = \sin A \cos H \qquad (10)$$

*Use of Charts*

Chart No. 1—1. For any day read declination on scale A opposite day of the month. 2. Find value of N on scale C by drawing a straight line from value on scale A to hour angle (sun time) on B.

Chart No. 2—1. Compute value of ($\phi$-N) for any latitude $\phi$ giving N the sign of the declination. 2. Fix a point on scale E by a straight line joining N on scale $C^1$ and ($\phi$-N) on scale D.

3. Find the required Azimth-A on scale G by a straight line joining the hour angle on scale F and the pointon E.—If N is—ve. and greater than $\phi$ the Azimuth is greater than 90°.—Azimuth is measured from south line.

Chart No. 3—1. The required altitude is found on scale H by drawing a straight line from Azimuth on scale G′ to ($\phi$-N) on scale D′.

Chart No. 4—1. Find the value of $\theta$ on scale L by a straight line from the computed angle A′ on scale J and the altitude on scale K. 2. Find the "Required Solar Intensity on the Wall" on scale N by a straight line from the value of $\theta$ on scale L to the "Solar intensity on a surface perpendicular to the ray", on scale M.

The value of the latter solar intensity is given in the A.S.H.V.E. Guide.

*Comparative Example*

For the purpose of comparison the following example is worked out by the radiant heat method and the standard method. The area considered is a window with 21 sq. ft. of brick opening, and 13.87 sq. ft. of glass. The time assumed is 3.30 p.m. on August 1st (3.30 p.m. is somewhere near the maximum cooling hour). The latitude $\phi$ of Toronto is 43° 40′ and the longitude is 79° 22′.2 The orientation of the wall is shown in figure 8. Proceed with the solution as follows:

Find the sun time by formula number (9).

Mean time is $M$ . . . . . 3 hrs. 30 min.
Equation of time ($E$) for August 1st (figure 7) . . . −6.2 min.
Longitude correction ($L$) = $\frac{4°-22'.2}{15°}$ = .291 hrs. . −17.5 min.

Therefore sun time ($S$) = hour angle ($T$) . . . . . 3 hrs. 6.3 min.

In Chart I, using this value on scale A and the hour angle on B, find the value of "$N$" = 25° 10′ on scale C ($N$ is positive since declination is positive).

Therefore $(\phi - N) = (43° - 40') - (25° - 10') = 18° - 30'$.

On Chart 2, using values $(\phi - N)$ and "$N$", locate a point on the index line $E$. With this index point and the hour angle on scale F, find the aximuth $A$ to be 71° 50′ on scale G.

On Chart 3 use the value of the azimuth and the hour angle to find the altitude angle "$H$" of 43° on scale H.

On figure 8, the horizontal angle $A'$ (84° 50′) between the ray and the wall is computed.

On Chart 4, using the horizontal angle $A'$ and altitude angle $H$, find the value of $\theta$ equal to 46° 50′ on scale L. The solar intensity normal to the sun is found from the A.S.H.V.E. Guide to be 283.8 Btu. Using this value and $\theta$, find the solar intensity on the wall as 204 Btu per sq. ft. on scale N. This value would be used for all sun-loads on the given wall surface.

The transmission factor for glass is .85. Then by equation 5 the heat transmission per sq. ft is

$$Q = ZH_s \sin\theta = .85 \times 204 = 173.5 \text{ Btu per sq. ft.}$$

The net area of glass is 13.87 sq. ft. Therefore the total heat transmission is $13.87 \times 173.5 = 2410$ Btu. The value obtained by using standard methods or equation 4 is 1160 Btu.

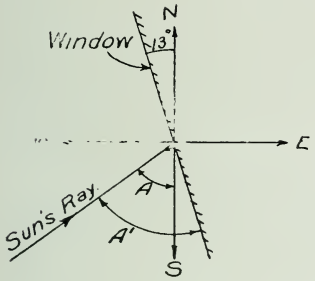
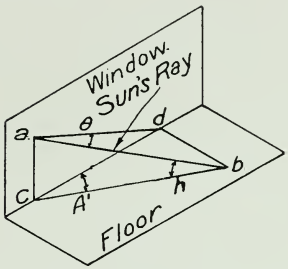



Fig. 8




$$\frac{bd}{ab} = \frac{bd}{bc} \cdot \frac{bc}{ab}$$

$$\text{Sin } \Theta \text{ sin} = A \cos h$$

Fig. 9

## Conclusions

The difference between standard methods and the theoretical method as shown above may be greater than 50%. There will be a similar difference for all the glass area on the west, and a small added sun-load for the south exposure. Additional research is desirable on this subject of sun effects. So far as the author knows, this is the first application of the monogram type of chart giving the solution of the sun effect angle on any vertical surface, and taking into consideration the declination, latitude, longitude and hour angle. This makes the chart applicable to all seasons and to all latitudes of the northern hemisphere.

The paper deals with one phase of the subject only, the cooling of a residence in summer. The field for air conditioning is vast. It already includes office buildings, department stores, theatres, auditoriums and certain industries. The application in industry is two-fold. It provides better working conditions for the workmen, resulting in increased output. It also allows the manufacturer to maintain the best conditions of temperature and moisture for the product. The latter factor made possible the operation of huge cotton mills in the dry southern states.

A great future for air conditioning is opening in the equipment of modern homes. At present the cost of air conditioning units is prohibitively high for general use. The economical installation is one combining heating and cooling. The public have lost regard for hot-air furnace heating, due to its abuse by small contractors. However, it may be made a very satisfactory system when an air conditioning unit is added. It provides a fair system for distribution of conditioned air, but some additional return ducts are usually necessary. There is every indication that air conditioning will make great progress in the next few years.

# Stamping and Stamping Dies

*Condensed from a thesis for the degree of B.A.Sc. in Mechanical Engineering*

BY DAVID R. ELLIOTT

In the past twenty years one finds the uses of the power press and its tools extending into so many branches of industry, that to-day it is an exception to find a well-organized plant, engaged in the production of small or large parts, that does not require the use of sheet metal working equipment to a considerable extent. It has become general practice to manufacture by some stamping process, work that formerly was produced from bar or forging. Therefore, in addition to the widely diversified line of products that have always been recognized as press work, there has developed numerous other classes of metal parts, whose manufacture has been transformed from the conventional operations of turning, drilling, etc., to the process available under press working methods. Perhaps no one industry shows this development to a greater extent than does the production of motor cars. One has only to compare the hand-made bodies of the first automobiles with those of to-day, produced in amazing quantities by means of sheet metal presses, and dies. In fact, the automotive industry, as it stands at the present time, would be impossible were it not for stamping, since in addition to the body all parts are produced in power presses with the exception of the engine, transmission and a few forged articles. Similar conditions exist in other industries where production is dependent to a large extent upon sheet metal products.

The process of stamping is employed for the production of repetition parts only, the operations being peculiar in themselves and the tools quite incomparable with other specialized shop equipment. The class of labour employed, the method of payment of wages, the handling and storing of equipment and material, etc., are quite singular and found rarely, if at all, in other branches of the metal working industry. Therefore, in the treatment of this subject it would be necessary to enter into much detail in order to give a complete conception and layout, but, owing to lack of space, this is impossible. It is proposed that this paper should include a description of equipment and material and it is for this reason the following pages contain, first, a description of the machine, the press; second, the tools, punches, and dies; and third, material, with special regard to its structural behaviour while being worked.

## Stamping Machines

Machines for the working of sheet metal are commonly referred to as power, or punch presses. These presses vary in size from the small manually operated bench type, to the large two thousand ton hydraulic machines. Arising out of the older punching and shearing

machine, the punch press has witnessed many radical changes both in design and available accuracy. Such features as the welded steel frame, the tie rod press, point control, etc., have served to prolong the life of the press and dies, and produce an article with greater rapidity and accuracy.

The general class of presses, for the working of sheet metal, include such types as single and double acting straight side, toggle, knuckle joint, arch, end wheel, gap frame, adjustable bed and inclinable presses. This classification refers to either the method of applying the force, the frame, or some other special feature, and for further information regarding these, the reader is referred to manufacturers' catalogues, where details, capacities, etc., are fully given.

In practice one is continually confronted with the problem of choosing a press to produce a given job. It is not uncommon to find one company producing the same part on a press of half the capacity used by another. This represents a substantial difference in both initial and operating costs. Such guesswork is still existant in many factories, but to make a practical choice, wide experience is necessary, or else some definite procedure must be followed to secure the best results. The last five years has seen many tests carried out with the object of determining some law or curve by means of which the correct press capacity would be given directly. Reference is here given to a series of test results compiled by C. W. Lucas, and appearing in 1933 American Machinist Catalogue, p. 181. The results given tabulate the operation performed, with a sketch, the material used, its thickness, and the pressure required. The problem is attacked in a practical manner and the operations covered are quite complete, but it is doubtful whether the problem can be solved in such a fashion. It is true that many every-day operations are similar, but if the report is to be complete, it must cover not only all operations, but materials and thicknesses as well. It is easy to see that this would lead to a table of such proportions as would deem it impracticable. The table also neglects to mention what type of press was used, and this in itself is an important factor as will be shown in the following paragraphs.

It is a well-known fact that during the power stroke of a press the frame deflects. This action is particularly noticeable in the gap frame press, where there is arc deflection—that is, side as well as vertical motion of the frame. For a long time little attention was paid to this point but it was finally indicated that a die, when used in a gap frame press had a much shorter run than the same die in a straight-sided press. (By run, is meant the number of finished parts produced before sharpening is required.) This led to a set of very interesting tests, made in gap frame presses, and also to a method of choosing the correct capacity.

A circular punch was first placed in a cast-iron gap frame press, and allowed to run until the height of burr on the finished part reached a definite value. It was then removed, examined, measured, sharpened and placed in a steel gap frame press, and again

allowed to run until the burr reached the same height as before on the finished part. The results of punch wear are shown in figure 1 where they are plotted on the circumference of the punch. The more rigid steel frame press produced the greater number of articles for the same punch wear. This led to the obvious conclusion that the less the deflection, the less the wear on the dies, but with the experimental data, it was possible to construct the chart shown in figure 2. It must also be pointed out that as the stock decreases in thickness, the allowable die clearances become less, so that the wear factor will increase. That is, providing the initial pressure required remains constant, the surplus capacity required to minimize wear increases with a decrease in the thickness of the stock. Figure 2 is a definite attempt to supply the demand for a method of choosing a press but it must be remembered that this diagram applies to a gap frame of a definite manufacture only, and should not be generally used on all gap frame presses.

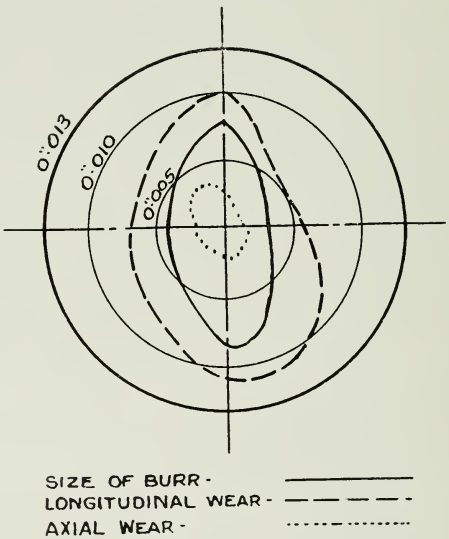



Fig. 1.—Comparison of Punch Wear to Size of Burr on Work.

In order to prevent arc deflection, the straight-sided press is used where the only movement of the frame is in the vertical direction. In this type straight columns connect the bed and working parts of the press and are centrally located with reference to the working centre line. One of the more recent constructions has practically eliminated even this vertical motion by the use of tie rods. Replacing the older solid frame is a cast or built-up sectional frame held in position by shrinking tie rods into place and thus placing an initial tension in the rods, and compression in the sides of the frame. The working load merely relieves the frame stress and does not further stretch the rods so that vertical motion is entirely obviated.

The question possibly arises as to why use gap frame presses when the straight-sided press can be constructed without deflection. It is quite probable that the next few years will see gap frame presses, especially for sheet-metal work where accuracy is required, gradually become obsolete since the tie rod type is being extensively built in small sizes. The chief advantage of the gap frame press, however, is its accessibility to the die which facilitates the feeding of the machine.

The function of the press in the stamping industry, although very necessary, is quite unimportant, since it merely exerts a given force along a definite line and supplies sufficient support for the dies. This seems quite insignificant in comparison to the size of the machine, but it is nevertheless quite true. By far the most important part of the equipment is the dies, a discussion of which will now be considered.

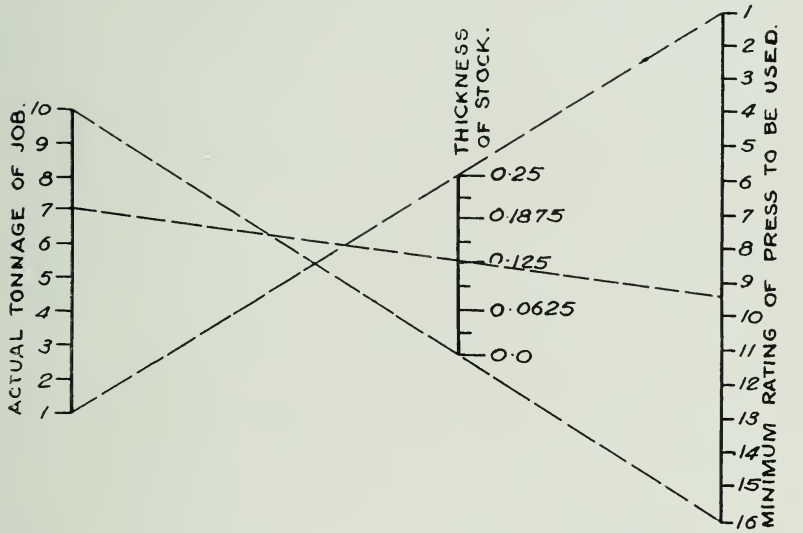



Fig. 2.—Correct Rating for a C-Type Press considering Stock Thickness.

## Stamping Tools or Dies

The quality of the product is entirely dependent upon the dies which work the material, and if they are poorly or cheaply made trouble is inevitable, and repair or renewal expenditures often exceed the cost of higher grade die sets.

The term dies is one given to a set of punch and die. Little distinction is made between the two since one is a counterpart of the other, but it may generally be stated that the punch is that part attached to the ram, or moving part, while the die remains stationary on the bed or bolster of the press.

Die materials vary widely but are generally some kind of steel. The punch is invariably made softer than the die so that in case of

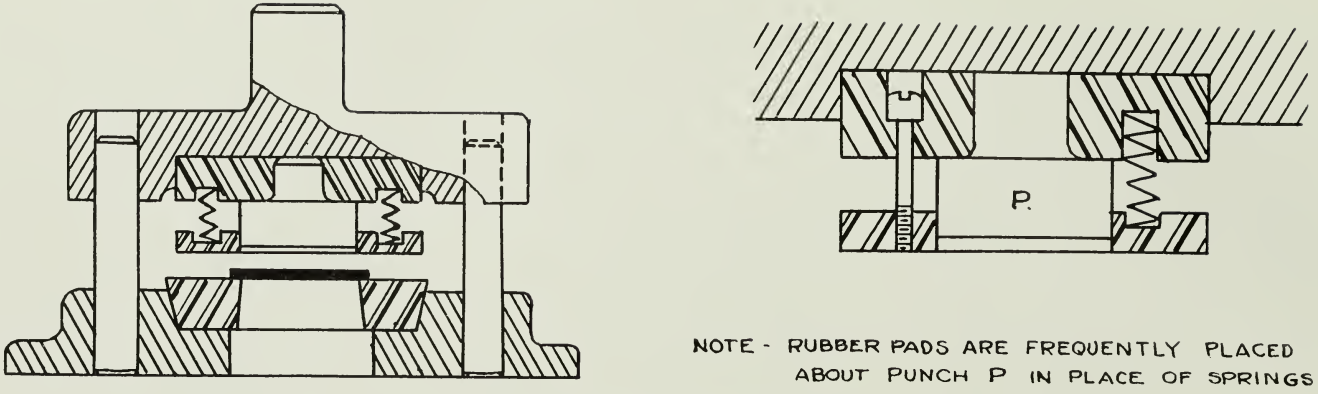



FIG. 3.—Typical Blanking and Piercing Die Construction Showing Details of Stripper.

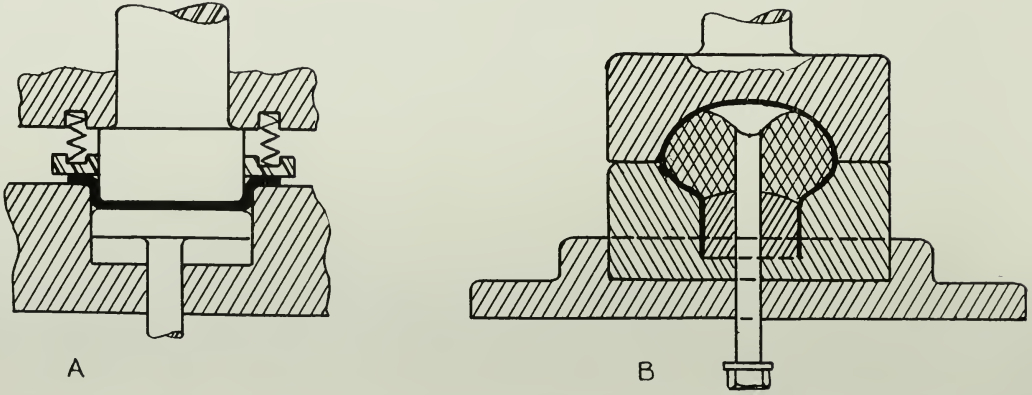



FIG. 4.—A—Features of a Draw Die with Pressure Pads. —B—Bulging Die with Rubber as Expander.

wear or accident it may be replaced instead of the die which is much more difficult to machine. All wearing surfaces are hardened and in the case of draw dies, where a high polish is required, both die and punch are chromium or nickle-plated. In large and unimportant sets, cast-iron is used and where forming operations require only a small degree of accuracy, oak dies are quite satisfactory. Die shoes are almost always cast-iron while the guide pins are hardened and polished steel.

The first consideration in the design of dies for a given job is to decide what operations are to be used. When production is large the amount to be spent may be fairly great, and combination dies built to reduce operations and labour costs. The opposite condition holds true for low production parts, but where the problem of safeties arises due consideration must be given them. Much time and thought has been given to the design of grills, sweep guards, and chutes, which, although saving many accidents, do not tend to accelerate production and as is more often the case, retard it. In the case of several simple, low-production dies it is necessary to equip each die with a safety device so that in the end possibly more money is spent on guards than would be if one compound die and its safety were used. This does not apply to presses carrying standard equipment, but in many cases to obtain maximum production a special guard must be built.

Stamping dies may be classified as follows, arising from a consideration of the effect of the working of the material. This division is usually given by authorities, and provides a suitable method of listing the equipment as well as for discussion purposes.

1. Tools that operate by shearing the metal.
2. Tools that shape the metal by drawing it out and so causing it to flow.
3. Tools that manipulate the stock or blank already cut out by some form of bending process.
4. Tools that by compressing the material cause it to flow into the desired form.

*Class 1*

Tools included in this class are blanking, piercing, shaving, notching, shearing, and trimming dies.

A blanking die is one in which a section of metal is cut from a strip or sheet regardless of its shape, the cutting being performed on the outer edges of the part. The scrap consists of the original strip less the blank, whereas in the piercing operation the scrap is removed and known as the slug. Blanking dies have one peculiarity in that the stock must be so placed in the die to give a minimum waste of material. In the case of a T section, if the blanks are cut out of the stock, end to end, it is obvious that there will be much more waste than if the blanks are placed side by side and every other T inverted. Many different arrangements are possible at times but in order to secure the best results not only must the waste be minimized but so also must be the labour. It is often

more economical to have a greater waste with a minimum amount of labour. When blanking dies become complicated and irregular, segmented dies are used to facilitate both production and repairing.

Punches or piercing tools are generally conceded to be round, but all shapes of holes may be punched. This conception is perhaps due to the fact that the first form of punch was used for the formation of rivet holes. At the present time the piercing of sheet metal has replaced many drilling operations without sacrifice of accuracy. Button, perforating and gang dies are types of multiple piercing tools. The button die consists of several punches mounted with dies, at some distance apart, and located by means of bars but having no single support other than the ram and bolster. Perforation dies do the class of work that their name indicates, indexing devices being required, but gang dies which are similar to the perforating type do not punch holes at regular intervals or require indexing.

Notching tools are similar to those that pierce, but they cut on the edge of the blank so that only a portion of the punch is under pressure. The notch may be single or multiple and when it occurs on circular articles, indexing is required. Since only part of the punch is under pressure, care must be taken that it is securely braced against side thrust and that a cutting edge is used.

Shaving operations may be compared to those of blanking and employed where great accuracy is required of the product. Usually blank sizes are left so that considerable stock is available for shaving and in cases of very accurate work, re-shaving. Rather than use an extra press for the shaving operation, these dies are set up with whatever die performs the previous operation, in a larger press and as the part leaves the last form it is dropped into the shaving die and brought to its final dimensions. This means that a finished article is produced for every stroke of the press, whereas if a second press were employed the article would of necessity be re-handled and re-run.

Cut-off or parting dies operate on strip stock of the correct width, producing a blank with very little scrap. They consist merely of a punch made in such a manner that when the material is cut, the second end of the first part and the first end of the second part is formed, the only scrap being the small slug cut out by the punch. It is a very useful and economical tool since it not only minimizes waste, but makes it possible to produce any length of blank.

Where an uneven edge is produced by a previous operation, such as drawing or forming, reshaping is obtained with trimming dies. The punch is usually piloted in some way so as to give the correct relation between the edges and the formed portions, the construction being similar to blanking and shaving dies.

*Class 2*

This second class of dies includes cupping, drawing, re-drawing, bulging and reducing dies.

In this case there is no cutting edge and in its place the edges

of both punch and die are rounded and polished so as not to "catch" the stock as it is caused to flow by drawing it out of tension. The general construction is that of a punch fitting a die so that the clearance is equal to the thickness of the stock. In the cupping and drawing operation (cupping is a shallow draw) the material is drawn out from under a pressure pad into a hole in the die by means of the blunt punch, the metal flowing from the flat to the cup shape. To illustrate the fact that the metal actually does flow it is only necessary to try and force a sheet of paper into a tumbler without wrinkles. The method of eliminating these wrinkles is to place a pressure pad actuated by springs, rubber or air pressure about the die opening so that as the punch draws the metal it is caused to slip between the pad and die. Spring and rubber pads although used extensively have a tendency to lose their effectiveness with wear and to produce a greater pressure at the end of the draw than at the start. For these reasons it is obvious that air beds are much superior, in which case the pressure may be regulated to suit the job or stock.

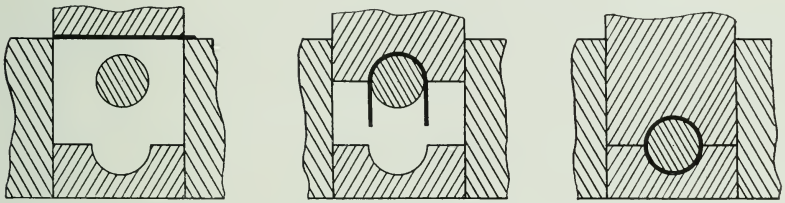


FIG. 5.—Progressive Forming of a Cylindrical Object in a Single Die Set.

The reducing operation does not draw the material in any way but is used to reduce the diameter or the other dimensions of an open-ended object such as a cylinder. Perhaps one of the oldest and best examples of this operation is that used in forming the bullet end of a cartridge shell.

Bulging dies are used on thin materials only (No. 20 U.S.S. gauge and lighter) and for such objects as household utensils, where the maximum diameter is greater than the diameter of the opening. This requires, therefore, such a material as rubber to expand on descent of the press and force the metal into the shape of the die. In many cases air or oil is used where the displacement caused by the punch is sufficient to form the metal in the die.

*Class 3*

This class includes bending, forming, twisting and curling dies.

Bending and forming dies cover such a multiplicity of tools that no definite description will be attempted. In any case the outline of the form or bend is on both the punch and die so that they fit each other by the thickness of the stock.

*Class 4*

In this division of tools is found such special types as extruding, riveting, staking, coining, heading, embossing and swaging.

Extruding dies are used where a certain amount of metal is required about a hole in the sheet metal. In this case a blunt punch passes through a previously pierced hole, causing the metal to be flared up around the edge.

The operation of riveting, heading, and staking dies is obvious, their use being confined to the assembly of parts.

Coining and embossing dies require great pressures to produce the part, and are so constructed that when the metal is squeezed it is surrounded on all sides by dies.

Swaging dies are used to give the finished part a smooth edge free from burrs and to generally improve the dimensions of the product.

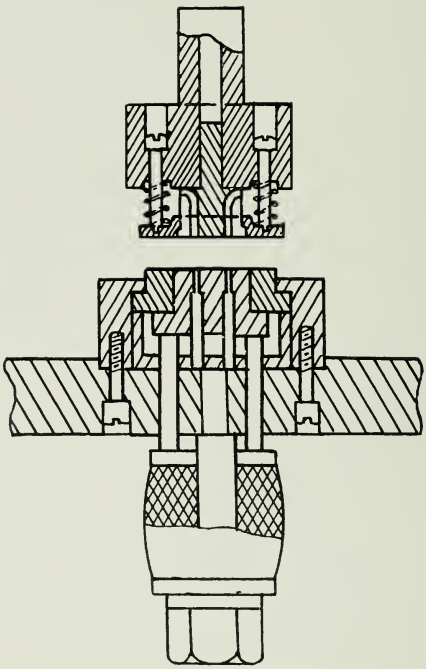


Fig. 6.—Compound Die with Rubber Knock-Out for Blanking and Piercing Washers.

In the above treatment of dies, single operations were chosen and discussed individually. In industry, however, combination sets are used to a large extent where such operations as blank and cup or blank and pierce are performed in one die.

In the die discussion of above, space prevented any detailed explanation, so that where possible it is intended that the illustrations should provide this deficit. It has also been necessary to

omit such points of design as clearness, location, and fastening of punches, etc. For such information the reader is referred to "Punches and Dies" by Stanley and "Tool Engineering Volume 3" by Dowd and Curtis. Although published some years ago these books lay down the fundamentals of die design and give tables of various dimensions for best results.

## Stamping Materials

Many materials are worked in punch presses, the usual form being sheet, flat or bar. Perhaps the most common of all materials is sheet steel, existing in a large variety of alloys and finishes. Brass, copper, aluminum, gold and silver form a second class while leather, cardboard, paper and fabric are worked with a special die known as a drinking die. Painted stock, chiefly steel, is now being extensively used since it is much easier to paint the sheet than the finished article. This makes it necessary to use special precautions in passing the stock through the die, because the same die is used for unpainted as well as painted stock.

In the operations under consideration the materials are cold-worked—that is, worked at normal room temperatures. In the case of the above-mentioned materials the crystalline structure becomes finer upon cold working and in any case is entirely distorted, thus rendering the material hard. In order to return the stock to a workable state it is frequently necessary to anneal it, in which case the grains are caused to grow and give rise to a new and regular arrangement, characteristic of its state before working. Annealing is required in many drawing operations since the material is severely cold-worked. Where the draw is shallow no specially large-grained or soft material is required, but where it is deep, special deep drawing stock must be used in order to prevent the necessity of annealing. In other words, the more severe the working becomes, the greater must be the grain size and resultant range between elastic limit and ultimate strength. If this range is small, cold working causes the material to harden and with added stress it fails, whereas if it were larger the stress required to harden would be much greater, or in excess of that applied so that failure would not take place.

The direction of the grain of the stock is an important feature, especially in blanking dies, where the part is to be worked in further operations. Consider a flat blank which is to be bent at some angle. If the grain is along the strip or at right angles to the bend, the operation will be performed successfully. On the other hand, if the grain is in the opposite direction the stock will open up when formed. Some authorities on the subject advise that in order to overcome this condition the dies should be inclined in their setting to place the grain direction at 45 degrees to the bend so that when shearing the sheet into strips the grain direction may be ignored.

The specification of a stamping material is usually given in terms of its composition before working, regardless of what its properties may be after it has been run. This is, of course, a necessity

since no manufacturer would guarantee his product to produce a given condition in an article where tools and procedure so greatly affect it. Therefore in laying out specifications for a material to be worked with dies in a punch press, the working condition must be carefully considered. The present day trend is to specify only generally, except in some cases of special requirements, and allow the material manufacturer to submit samples which vary in composition. The material producing the best article with the least trouble and loss of time is therefore readily chosen.

From the above discussion one is able to obtain some conception of the wide range of articles that may be produced from sheet metal by press-working equipment. Engineers will be frequently if not constantly required to investigate the production of a part by press working methods. They will therefore find it of much value to study this branch of manufacture and to investigate its new developments.

The stamping industry is comparatively new. For verification of this point one has only to glance through catalogues of to-day and compare the space occupied by this industry with that of five years ago. The development and application has been rapid yet there is much remaining to challenge the ingenuity of both engineer and tool-maker. In conclusion it might be stated that although it is popular to condemn mass production as the source of the present industrial condition, this process will be the method of manufacture of innumerable parts in the future and many new developments may be anticipated along these lines.

# The Ontario Research Foundation

*Adapted from an address by Dr. H. B. Speakman, Director of the Ontario Research Foundation, Toronto, before the University of Toronto Engineering Society, October 30th, 1934*

Dr. Speakman first outlined the development of the work and some of the problems encountered. In spite of the decreased business activities during the past five years, 91 per cent. of the amount promised to the foundation by manufacturers, business men and corporations in 1928 has been received. Conservative investments have been made by the Foundation, resulting in a small surplus.

In an increasing number, executives and operators in industry are turning to the Foundation for advice and assistance: and the result in many cases has been co-operative work in the laboratory and plant. An example of productive investigation has been that undertaken for a manufacturer, whose waste product could not be thrown into the sewer because of its bad odour. Last year some 200,000 lbs. of this same material were sold as an important material required by the leather industry.

Dr. Speakman illustrated, with the aid of slides, some of the specific problems met by the Foundation. Tests on fabrics, to determine the fastness of dyes exposed to sunlight, had been made, resulting in valuable information for the automotive industry. Experiments on patent leather finishes had also been undertaken, at the request of leather manufacturers. On the completion of tests on the effect of intermittent pressure on rubber and leather washers, a gas pipe union of an entirely new design was developed, which will probably be placed on the market shortly.

Further experimental work has been done on the reduction of Ontario iron ores with Northern Ontario lignite. If this lignite is dehydrated by the Fleissner Desiccation Process, or simply by means of flue gases, the calorific value can be raised to 80 per cent. of that of bituminous coal. It is available for use in Northern Ontario at a lower cost than the coal from other sources (real comparative heat values considered in the form of pulverized fuel), and is suitable for the reduction of these iron ores. The economics of the lignite situation show some promise, and for certain grades of iron ore, thus reduced, a demand may be developed.

Dr. Speakman then mentioned work that had been done in the location and killing of a certain parasite which preys upon ducks, to the delight and amusement of the Society members.

It was also pointed out that the idea that scientific men are incompetent in financial matters can be counteracted by care and efficiency in handling the business side of such work. Manufac-

turers must be educated to accept legitimate charges for scientific investigations. The policy of the Foundation, which is not to perform routine analyses in competition with private laboratories has constantly to be explained to industrial executives.

Dr. Speakman's talk was enjoyed to the full by those members of the Society fortunate enough to be present and we owe a hearty vote of thanks to the distinguished gentleman for his interesting remarks.

# Construction—Its Economic Past and its Possibilities

*Adapted from an address by W. D. Black, Vice-President of Otis-Fensom Elevator Co., Toronto, to University of Toronto Engineering Society, November 14th, 1934*

Before any intelligent consideration can be accorded the future of the construction industry, it is necessary to examine its past record and present condition, also to determine, if possible, its importance in the national economic structure. Despite the fact that reliable construction statistics for Canada are available only since 1911, they are sufficient to indicate a degree of instability in the industry that a mere statement of figures is inadequate to describe. Perhaps it is sufficient to say that during the past twenty years the annual value of recorded construction in Canada has varied anywhere from $83 million to $576 million. A variation of 700 per cent. in a major industry during one business generation is surely food for thought. Twice during the same period production and consequently employment in the construction industry has diminished to the extent of approximately 90 per cent. in the course of three years. To judge by population and trade statistics, the fundamentals of our national economy, which should logically motivate the construction industry, have not varied more than 25 per cent. during the same period. In so far as they do vary, they do so in a constant and consistent manner, in decided contrast to the erratic and irrational course of the construction industry. It is clear that the industry has become divorced from its proper source of energy which would endow it with a generally stable or at least equable momentum. Its course has been disrupted by some other agency, with the consequence that while population increases, new industries spring up, depreciation continues and new regions are developed, all broadly speaking, at a constant rate, the construction industry lies periodically dormant.

In proportion to its extent and the number of men normally employed by it, construction is probably more dependent upon external conditions than any other considerable industry. It is, in fact, nothing more than an instrument of service, entirely devoid of initiative or volition of its own. It cannot create markets for or stimulate sales of its product. It does not finance its own production, but merely the mechanical means of production. Its activities call for the expenditure of vast sums of money apart altogether from the capital invested in the industry itself. Consequently, it is powerless to control its own destinies and so far as its rate or volume of production is concerned, is entirely dependent upon those who supply the funds which it merely converts into buildings or other forms of construction. Here, of course, is the explanation of the erratic nature of the construction industry and its divorcement

from its fundamental basis. The money or credit which really motivates the industry by financing its production is not made available to it in accordance with any natural demand.

If the construction industry does not control the volume of its own production, who then does? In the first instance, of course, those who employ the services of the industry. In short, all those who build, in whatever form. How do they procure the funds with which to build? Essentially in three ways. First, by obtaining mortgage loans from financial organizations. Second, by the sale of corporation bonds. Third, by direct expenditure of capital resources. The first and second means are together responsible for much the greater part of construction volume. In times of expansion, that is, during the upward swing of the business cycle, mortgage money is readily procurable, corporation bond issues are freely originated and distributed through the agency of banks, investment houses, and all the financial machinery which modern civilization has called into being. Here, in what can only collectively be termed "finance", we find the agency which in the final analysis completely controls the construction industry. While using the term "finance" to include all the financial aspects of our economic fabric, it is obvious, of course, that it embraces a wide diversity of organizations entirely unrelated and without any centralized authority or means of co-ordination.

Whether from lack of the necessary co-ordination or from the absence of any realization of social responsibility, certainly "finance", in the loose and comprehensive sense in which the term is used, has never yet shown any inclination to assume this responsibility of industrial stability in the slightest degree. Certainly so far as the construction industry is concerned, the reverse has prevailed. Confirmation of this is readily available. During the peak years, 1928 and 1929, financial companies were not only willing but eager to advance funds on building operations. Now, at a time when the construction industry is approximately 90 per cent. inoperative, when employment is rife, when building costs are low, when every indication, in fact the virtual certainty, is that we are at the beginning of a general upward business trend, these projects, which could only be regarded as sheer necessities to-day, if they even admitted of consideration in 1929 or 1930, are withheld. Frankly, there is no justification for the hope that those who give impetus and apply the brakes to the construction industry desire to or will accept any responsibility for its essential stabilization.

You may be inclined to doubt the positive necessity for stabilization of the construction industry in particular. It is, however, a matter of common consent, that a state of stability, so far as it may be compatible with the constant advance of technical and social knowledge, is desirable for all human activities. It is safe to assume that so far as trade and industry are concerned, it is agreed that constant stability, though not necessarily rigidity, is the ideal towards which we must strive, if civilization is not to be disrupted or retarded.

Admitting that we desire to stabilize our economic life, how best can we go about it? Obviously, first by analyzing it in order to determine the nature of the forces which disrupt it and how, when, and where they act. We have always been aware that our economic fabric was woven from many strands, but it has required the rude shock of the present depression to make us realize that beneath the elaborate pattern there is a basic weave, the very warp and woof of modern life, which in terms of employment are (1) the workers producing goods and (2) the workers producing services. This is the primary division of our economic system. In turn we find that the producers of goods are divisable into major categories: (1) those producing goods for immediate or quick consumption, (2) those producing goods of a durable nature to be used over comparatively long periods of time.

The durable goods workers are, as the term implies, engaged in the production of goods designed to last and be used for considerable periods of time. Broadly, they embrace all the conveniences and facilities of modern life. They include all forms of construction, all mechanical means of transportation, machinery and all the various forms into which enduring materials may be transformed. It is readily apparent that there are virtually no limits to the possible variation in the demand for these goods. It is evident that in terms of unemployment (which is the evil manifestation of depression), the durable goods industries are responsible. Depression in effect is primarily reduced production of durable goods. Stabilization of our national economy implies stabilization of our durable goods industries.

It is proposed that the government should set up a permanent Board or Commission, representative of the governmental, building, financial and labour interests. This board was to be endowed with certain powers which were essential to its objective, the stabilization of the industry and consequently the prevention of otherwise inevitable periods of nationally embarrassing unemployment. It was inferred that to ensure the future stability of the building industry, it was necessary to determine the level at which, under the ideal conditions of economic justification, it would now be operating, to raise production to that level and to maintain it at that level or at such other level as would, from time to time, appear to be economically justified.

Having brought building activity to the predetermined economic level, it would be the permanent function of the Board to maintain it at that level, within practical limits. Generally, it was proposed that the Board's prerogative of permission to build should be used to gradually accumulate an adequate reserve of suitable building, to be proceeded with when necessary to adjust the level of activity. More particularly, it was suggested that the aggregate of Dominion, Provincial and Municipal building, together with the virtually public construction of such concerns as the railways and harbour commissions would provide an easily controlled and extensive volume of building to be utilized in this stabilizing manner.

There is another element, however, which, while mentioned, has not been fully assessed as a stabilizing influence. I refer to the aggregate of all public construction as apart from private enterprise.

It is assumed that public construction could be reduced to the vanishing point. In practice, this would be virtually impossible. In any circumstances, some irreducible minimum of public construction would necessarily be executed. Further, the retardation of private construction, resulting from withdrawal of public works, might very well amount to less than $80 million. Under these conditions, the curve of total construction would rise above the mean economic line of $300 million. The extent by which it exceeded this line would depend upon the reducibility of public works. This is where what has been termed the quasi-public building of banks, insurance companies and other organizations of a national character would play a part.

If public construction, and if necessary quasi-public construction had been, to the required extent, withheld during the peak years, the unexecuted projects would, when private enterprise receded have provided a very considerable reserve of construction with which to subsequently sustain the curve of total activity. Estimating, it is believed that approximately $500 million worth of construction might have been so reserved during 1925 to 1931, when private enterprise was rampant. Such a reserve would, if it were available at the present time, deprive the immediate future of the terrors of uncertainty. In comparison, the probable public works expenditure of $50 million seems feeble.

There are only two active or positive routes to recovery. There remains, however, the possibility of passive or negative tactics, the policy of "stand pat". This is the course which Canada has followed up to now. Perhaps if the problem were solely one of recovery and we had no precedent or experience upon which to base an active programme, there would be some justification for "standing pat" or at least for hesitation and doubt. But the problem is in reality one of permanent stabilization, towards which end present recovery is but the first step. Delay in taking this first step can only aggravate the ultimate problem, and will if it is continued into the next upward swing of the trade cycle, postpone all efforts to stabilize business for another generation.

If our political institutions evolve, or are developed, along the lines outlined, this difficulty would be automatically overcome, since the advisory boards would offer a splendid opportunity to the best men in every walk of life to play an active and effective part in our social and political affairs. This may be considered not least among the benefits to be derived from such a development of government. It is an aspect which should be of especial interest to just such young men as yourselves. The engineer has always been at a particular disadvantage in this respect. He carries his stock-in-trade in his head, and it is seldom if ever possible for him to delegate the earning of his livelihood to others. He must stay on the job and certainly cannot desert it for the long periods required by any

form of present day political life. If there is one practising engineer in our Canadian Government to-day, he must necessarily be in rare and special circumstances. It is a regrettable situation, for whatever his shortcomings, the training and experience of the engineer are conducive to "getting things done". The advisory boards such as I have suggested would not require repeated or continuous attendance. Many of the problems with which they would be required to deal could be studied and decided upon by the individual members during the ordinary course of business or practice. They could attend the few but decisive meetings, if not exactly predetermined, then certainly pre-informed.

# A National Self-Liquidating Housing Programme

*Adapted from an address by J. H. Craig, of Craig and Madill, Architects, Toronto, to the University of Toronto Engineering Society, November 29th, 1934*

*The Engineer's Relationship to the Problem of Distribution*

The relationship of the Engineer to the problem of distribution was forcefully brought to my attention some three years ago in an address by Dr. Hamilton Fyfe, Principal of Queen's University, when speaking at the annual dinner of the Engineering Institute of Canada. Dr. Fyfe had been on a tour of the mines and of the pulp and paper mills in Northern Canada and had been chiefly impressed with the dependability of the work of the engineer, and in contrast, the failure of those who directed the flow of capital into fruitless channels. This was exemplified by a multiplicity of pulp and paper plants; duplication far in excess of economic requirements, and consequent stagnation in that industry. He advised engineers to bring to play on economic problems the training acquired in the practice of engineering which had resulted in the work of the engineer functioning efficiently when the work of others in the field of distribution had failed.

Langdon W. Post, tenement house commissioner to the New York City Housing Authority, has recently published an extraordinary report, the result of a National Survey of the potential capacity of the American industrial machine. The survey was originated by the Federal Emergency Relief Administration and completed by Mr. Post.

The report has been summarized in part as follows:

"First, that in the last five years, the people of the United States deprived themselves of goods and services valued at 287 billion dollars which they might have had if the full capacity of American industrial plants had been utilized;

Second, that masses of the population were inadequately fed and clothed even in 1929, when the nation as a whole was spending at the rate of 80 billion dollars per annum;

Third, that in that famous year, 1929, inequitable distribution resulted in the inadequate feeding of 16,000,000 people;

Fourth, that despite the fact that the United States is industrially equipped to produce and consume at a rate of approximately $4,370 per family, 60 per cent. of the American people are financially unable to live in proper homes;

Fifth, the survey is said to have proved that the depression was and is needless and that the economic ills of the boom days, when 16,000,000 of the people were inadequately fed, were also needless."

It is obvious from the foregoing that technological advances have not been translated into a corresponding increase in the general

standard of living. Consequently the field of the engineer is circumscribed and in times of depression he is victimized by the forces which refuse to accept the gifts he has to offer.

Consequently a primary responsibility of the architect and engineer of the future must be the combating of these forces which tend to circumscribe the natural field for their professional activities.

*The Need for a National Housing Programme*

The need for a National Housing Programme is closely allied with the problem of unemployment. Figures published by the Canadian Council of Child and Family Welfare on June 30th of this year, showed 1,100,000 persons in Canada to be on relief. This showed a reduction of less than 7 per cent. on figures published for Nov. 1, 1933, and cannot be considered to be more than a seasonal improvement. The evidence adduced before the Price Spread Commission at Ottawa has revealed appalling conditions existing in the matter of wages among those who are employed and the consequent dimunition in the spread of purchasing power cannot tend to increase employment.

When one man who normally spends all his earnings is thrown out of employment, his purchasing power is reduced by the amount of the wages he formerly received and this reduction of purchasing power automatically reduces the money in circulation which pay's another man's wages.

Recovery under a laissez-faire system is dependable upon the return of public confidence, the loosening up of credits and the extension of building loans at rates of interest which will encourage the revival in construction. The public demands a minimum return of 6 per cent. on mortgage money and yet the expectancy of receiving this return is so limited that both borrowers and lenders are scarce.

The necessary confidence cannot be restored upon an adequate scale until unemployment is eliminated and wages are restored to a normal level. The public must become convinced that industry does not support the wage earner but that the wage earner is the essential support of industry. On this hypothesis, employment must precede recovery. Private enterprise has failed to take the initiative and revival of construction and the durable goods industries dependent thereon must come from some other source.

If we are to reach normal times within the year, activity must be stimulated, and yet such a programme must be devised to avoid a conflict with private enterprise which would retard recovery from this source. The National Government is the only body large enough to institute an adequate programme on a national scale.

Lacking effective demand (that is ready money and a desire to invest it in construction), a very real demand exists in the obsolescence of dwellings which are occupied by low-paid workers. This demand exists not only in the slums of great cities but in towns and villages and on the farms, and the provision of adequate housing for this class of worker provides an uncompetitive field for the absorp-

tion of the unemployed construction workers on a national scale and in localities in which they at present reside,

A brief survey of Toronto's slum areas should convince an unprejudiced observer that private enterprise has done nothing in more than fifty years to improve dwelling conditions for the minimum wage earner. The replacement of slum dwellings and minimum cost houses throughout the country should then provide the ideal uncompetitive field.

*The Housing Plan*

Where is the money to come from, at a rate of interest which will enable the low wage earner to live in dwellings above a minimum health standard, in dwellings which do not expose their children to serious dampness, foul odours, attacks by vermin, insanitary plumbing and the effects upon health of inadequate food storage accommodation, as well as the effects of association with others living under similar conditions?

There is a source from which the necessary funds can be raised without the burden of additional taxation or the imposition of excessive interest charges! The Dominion Government may divert a portion of the funds at present raised for relief purposes into a national housing programme, and finance the balance of the cost by governmental lending, at a rate not exceeding $2\frac{1}{2}$ per cent. This is the only source which can provide the necessary funds to finance the Self-liquidating Programme on a national scale.

To obtain the necessary funds, the Dominion Government should sell its securities to the Bank of Canada at a rate not exceeding $2\frac{1}{2}$ per cent. How funds may be obtained at this rate of interest will be demonstrated later. It is suggested that the Dominion Government lend these funds to the provinces under arrangements analagous to those under which money for housing was disbursed in 1919 and 1920. For the administration of these funds each province should set up a Housing Commission with an adequate technical staff to ensure economic expenditure. The funds should then be loaned to municipalities for slum clearance and municipal housing projects. Loans to private individuals would be made directly by the Provincial Commission. The Provincial Housing Acts of 1919 could be revised and amended to meet present day conditions. Whereas the Dominion Government can exert no direct control over housing in the provinces, it should determine that loans which it extends for housing purposes are to be economically and efficiently expended, if a lot of useless monuments to the depression are to be avoided. To accomplish this, a Dominion Housing Commission should be established, which should employ technicians competent to pass on all municipal projects for which loans are to be made.

Funds should be available for two types of enterprise:

(1) Slum clearance and re-housing.

(2) Loans to private owners of low cost dwellings which are now obsolete and which should be replaced.

To finance the programme, the Dominion Government over a three-year period, would sell to the Bank of Canada its securities amounting to $400,000,000. The amount required for slum clearance, 30% of the total or $120,000,000, should be obtained at the rate of 2%, and the remaining $280,000,000 at the rate of 2½%. To extend these long-term loans, the Bank of Canada must increase its capital stock by $200,000,000. This stock must be offered to the public at par.

Due to the scarcity of attractive securities, it is more than probable that this issue of stock bearing 4½% interest would prove particularly attractive to the investing public and would be subscribed for within a reasonable time. Failing this, there are provisions within the Act to cover the situation.

*Benefits to be derived*

The results of a three years' programme may be summarized as follows:

1. The first year's programme of $120,000,000 would achieve a saving of $45,360,000 on relief costs and should remove 777,000 persons from relief.
2. At the end of the second year unemployment would be practically at an end.
3. The third year would give sufficient impetus to private enterprise to maintain equilibrium.
4. With unemployment eliminated, our national portals would be re-opened to immigration which alone can provide the rate of increase in population which is necessary to properly employ our present excessive capital equipment.

It should be noted that the adoption of this plan will not increase the housing facilities of the country but will only replace obsolete and insanitary dwellings with houses fit for human habitation. The increase in population will result in a natural demand for increased housing, which will tend to maintain balance in construction output.

Social welfare under this programme would be achieved as a by-product of industry and not through charity; the morale of the workers would be restored and a stable foundation established for the future development of our national life.

# Canada's Challenge to Communism

*Adapted from an address by Major A. R. Lawrence to the University of Toronto Engineering Society, December 14th, 1934*

The present economic depression presents a grave problem, especially to the engineer. The solution can only be arrived at and applied by men who have been trained to think clearly and logically. Many solutions have been advanced in the past few years, notable among which is that adopted by Russia. It remains for the trained scientist and engineer to accept the challenge thrown out to the whole Christian world by Russia's attitude.

In Russia to-day the body of Lenin is preserved and worshipped by his followers as greater than God. It is Russia's claim that the principles of Lenin have done more for the country than Christian principles ever did. On the face of it their supposition is correct, for a comparison of Russia's economic index with that of any Christian country shows that Russia has been steadily improving while the so-called Christian countries have been just as steadily declining. The challenge to Christianity is obvious, for Russia stands for anti-Christ, state ownership, repudiation of debt, free love, no free speech, property destruction.

Canada, as a Christian country, has only two courses open to her. She may either accept defeat, thus acknowledging Russia's policy and renouncing the very Christian principles on which the whole British Empire is founded; or she may change her economic structure to conform to Christian principles for it is obvious that there are many fallacies in the present system.

One of the greatest evils in the present economic structure is the issuance of currency in proportion to the amount of gold stored in some deep dark vault. Money is not a measure of any single commodity but is merely a measure of wealth and as the wealth of any country is its trade, both internal and external, money should be then a measure of that trade.

Currency is but a *measure* of the volume and value of trade goods and services. Therefore, the total amount of currency issued should be in proportion to the volume and price of trade goods and services, or, in other words, in proportion to the *income* of the people.

## Issue of Currency

The total issue of currency should be in proportion to the number of transactions requiring to be paid for in cash, or in proportion to the *total income* of the people. This issue should be localized to the requirements of each individual town, city, county and province. Where cash is the primary medium of exchange, the actual currency in circulation should be about 10 per cent. of the *income* for that particular locality; the remaining 90 per cent. would be available in *credit money*. These percentages would vary from place to place according to whether *cash* or *credit* were the predom-

inating system of transacting business. The issue of actual cash, however, would remain constant, while the credit money would be the variable factor.

### Banking System

In order to issue money in proportion to the national income, the banks would have to be nationalized and would then become merely a clearing house for the localized centres and would keep a current record of the income for their own locality. They would also be of a great assistance in the levying of the taxes. In order to prevent possible hoarding of ready cash each person should be required by law to deal with a certain bank in his neighbourhood.

A small tax would have to be levied on income to cover the expenses of running the banks.

### Interest

As money is not in itself productive, interest on money as money should disappear. Money invested in a sheep farm is not entitled to any return until the sheep farm has produced a *natural increase or profit*. Then the money is only entitled to a fair share of that profit after the profit is sufficient to pay for (*a*) the sheep and their sustenance (raw material), (*b*) the keep of the shepherd and his family (labour).

The same rule would be applied to money invested in industry. Money so invested would come under the heading of *common stock*. As no money should have a preference, therefore, all *industrial bonds and preferred stock* should be replaced by the *common stock*. This money should not be entitled to any return until the raw material and labour had been paid for, and then only a fair percentage of the natural increase or profit.

Mortgages and government bonds for public works would have to disappear. Consider a government 40-year bond at 5 per cent. issued for a public building. In 20 years the building has been twice paid for and in 40 years it has been paid for three times without increasing the usefulness or value of the building proportionately. To pay for the works, the government could issue new money which would correspond to the rise in the income due to the payment of the works.

Borrowing money from the government for building homes should likewise be free of interest for the home is non-productive and there is no *natural increase* or *profit* in running and managing a home. Money borrowed to build a home would increase the income in that locality to that extent so the money must be issued from the government to correspond to the increased income.

Therefore a man wishing to build a home could borrow from the bank money issued expressly for the purpose in proportion to his own income. He would be required to pay back the principal *only* in a series of yearly or monthly instalments.

### Taxation

Taxation should be on *income* only. As the banks would be nationalized and everyone would be required to deposit with the bank in his neighbourhood, the taxes could merely be deducted from the income so deposited.

Consider the case of the farmer who has worked hard all year but is faced with a crop failure. He still has to meet an exorbitant property tax plus the interest on his mortgage, and, through no fault of his own, his income is reduced to such an extent that he is unable to pay. The only fair way is to tax his income alone.

The only taxes necessary under this system would be a small tax to pay for the running of the banks and government and education.

### International Trade

With the final abandonment of the gold standard, nations will be obliged to think in terms of goods and services instead of currency. There would have to be established a *world central bank* which would act as a clearing house for the nations' trade. Trade would then be on a *debit and credit* basis. International and war debts can never be paid under the present system where the interest is piling up year after year with the principal as yet untouched. Abolishing interest and considering the debts from the standpoint of goods and services, payment would then be a simple matter under the debit and credit system of the world central bank.

The challenge of communism must be answered at once, for Canada can never stand another depression such as the last. Therefore, the problem cannot be passed off on the younger generation to solve, as so many of our leading men would have it. The solution must come from those who are already in power, but the younger generation must fully appreciate the problem and give their wholehearted co-operation to its solution. It will not be necessary, then, to form a new political group, but merely to convert the existing parties to the new way of thinking and invest them with the power to produce a new economic structure which will conform to Christian principles.

# Streamlining

*Adapted from an address by W. J. Davidson, Engineer in charge of Research and Experimental Laboratories, General Motors Products of Canada, Ltd., to the University of Toronto Engineering Society, January 25th, 1935*

Streamlining of automobiles as progressively developed by General Motors during the past few years has struck the public fancy and has been a matter of widespread discussion. Unfortunately, much misinformation is current in this discussion and it is deemed advisable to make clear the facts as we know them to the end that this worth-while development may be understood and fully appreciated by the public.

## What is Streamlining?

While streamlining is an expression which at the moment has become a byword with the public—is one of the trends of the times, so to speak, and undoubtedly will continue—it is difficult to define the word exactly. It is probably safe to say that a perfectly streamlined shape is one which most efficiently displaces the medium through which it is moving. To make this very simple we might say that a streamlined shape on a motor car is one which, with a minimum of resistance, bores a hole through the air and fills the hole in after it. If the shape is 100 per cent. efficient there would be no retardation of motion by the fluid except the small amount due to skin friction. Streamlining has been familiar to most people as applied to airplanes and boats. It is only in recent years that the public has been conscious of the beginning of a stream-lined shape on motor cars although we have been steadily working toward it for a much longer period.

Aerodynamics, the study of air in motion, is not by any means a new subject, nor is the question of its application to motor cars a new thought with automobile engineers. As far as General Motors is concerned, scientific streamlining accompanied by an appearance which has met with public approval, has been applied to our cars in varying degrees for several years.

## What does Streamlining a Motor Car Accomplish for the Car Owner?

The chief benefit of streamlining as far as it has progressed, has been an improvement in the *appearance* of automobiles. When man first began to make things, he had no standards of beauty about him other than the things in nature. Due to this fact, humans have from the beginning unconsciously regarded those things which follow on approximate natural lines as more beautiful than those that do not. Nature has shaped her handiwork so it may best survive. Trees bend with the wind so they will not break. Fish and birds

are shaped so they may move most efficiently in the element through which they swim or fly. Consequently, the trend toward shaping an automobile so it will more efficiently operate in the element through which it must travel is a move toward a shape which humans instinctively regard as beautiful, and automobiles are beginning to look more like the fast-moving objects in nature.

The effects of streamlining on the motorist's pocketbook have been over-emphasized. Tables have been published and statements made to the effect that even at moderate driving speeds large savings of horsepower are possible, thus enabling engines to be reduced in size with a consequent increase in economy.

In view of the fact that streamlining has become a very definite style vogue, finding expression in railroad trains, airplanes and steamships as well as in motor cars, let us see what the actual advantages are.

The operating conditions for each of these means of transportation are so different that each must be considered on the basis of its own individual circumstances. So far as motor cars are concerned, streamlining does not offer any substantial economies in the first cost nor in operating cost. It might be assumed that weight and cost would be reduced through the possibility of a smaller power plant for the streamlined object. However, in a modern motor car, the ability to accelerate rapidly, or quick "pick-up", together with hill-climbing, is an important consideration, and the power required is largely independent of the shape of the object.

If we were willing to accept a substantial decrease in performance, there would be some gain in economy and a smaller power plant would become possible, but the saving in chassis first cost would probably be largely offset by the increased cost and weight of the streamline design of the body. Thus the most that can be expected in efficiency under present conditions is a slightly higher maximum speed plus some economy advantages at a given high speed—all other conditions being the same.

Further, it has been pointed out that an aerodynamically designed motor car body immediately provides a certain seating position in the car contributing to greater comfort. In some cases width of seats has even been stressed as one of the vitrues. Both of these ideas are obvious fallacies as streamlining has nothing whatever to do with the position in which you sit in a motor car. Seating could be comfortably arranged in a body the shape of a box car. Ease of ride has even been attributed to streamlining whereas it is obvious that the outside shape of a car has nothing to do with how it rides.

## The Problems in the Design of a Motor Car

Automobile engineers must keep one thing constantly in mind: that the motor car fundamentally is a vehicle for transporting people with dispatch, safety and comfort. The most important factor which we have to reckon with in designing such a vehicle is the size and weight of people. Fortunately this factor has remained reasonably constant over a long period, and, as far as we can see at the

moment, will remain so for some time to come. The problem, then, in designing comfortable, safe, and speedy motor cars, is to select the number of persons you wish to carry, provide seating that is comfortable as to posture, length, and width, on what might be termed a platform, locate the mechanism that rolls the vehicle along in the most satisfactory manner, and then consider the problem of putting an envelope over the whole. It is in the designing of this envelope that streamlining plays its solo part. Some people have wondered why automobile engineers did not copy the lines of the airplane and dirigible. It is because these shapes travel completely surrounded by a fluid. A motor car does not. Furthermore, twenty-four odd million motor car owners in the United States insist upon driving in crowded city traffic, turning around sharp corners in narrow streets, parking in fifteen-foot spaces and desire to be able to drive from one to seventy miles per hour on concrete ribbon sometimes only twenty feet wide without having to worry whether the wind is blowing against one side of the car or the other. What we are pointing out here is that the perfect aerodynamic shape is quite likely to be unstable in a motor car because a motor car has also another essential characteristic in that it still must roll on wheels which attach it to the road, whereas airplanes and boats operate in fluids which make their direction a very flexible thing. The streamlined automobile must be designed so that we still preserve head and leg room, normal body width and keep the car from being too long to handle in traffic and on sharp curves, and above all maintain roadability.

I believe that motorists will be better satisfied with the new-shaped bodies after they get them if they have not been misled to expect them to do more than is inherently possible. The wise thing to do, for the time being, is to expect not great operating economies, but a definite trend in appearance development. In this connection it must be borne in mind that appearance trends can be carried to the point only where utility is not sacrificed.

# Lightweight Diesel Engines

*Adapted from an address by F. G. Shoemaker, General Motors Research Corporation, to the University of Toronto Engineering Society, January 25th, 1935*

During the past year a great deal of publicity has been given to the new lightweight, high-speed streamlined trains being developed, both in America and Europe, and to the fact that Diesel engines are being used to drive them. The question naturally arises, why this sudden enthusiasm for lightweight, high-speed Diesel engines? And if these things are so desirable, why haven't they appeared before now? Obviously, sufficient time is not available to cover these subjects thoroughly so the discussion will be limited to lightweight Diesel engines, and in particular those built by the Winton Engine Corporation for several of the high-speed trains. Other engine manufacturers are working on light engines, too, but so far none has been put into service.

Looking back but a little way in the history of engines, we see that the steam engine first became useful in stationary installations. They were heavy, low-speed machines, requiring considerable space for the engine, boiler, and fuel, but were still a great improvement over the wind or water power. They first entered the transportation field in marine service and in a very short time practically displaced sails as a means for propelling passenger and cargo vessels. Larger cargoes could be carried at higher speed.

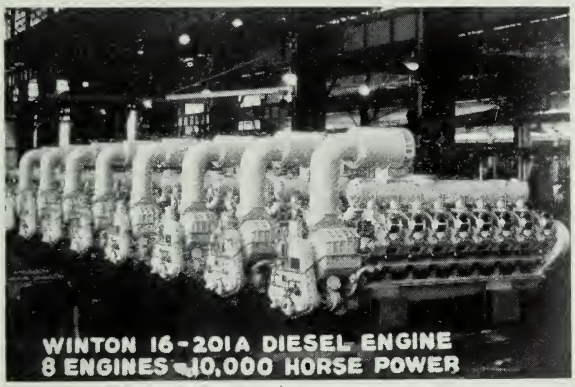
While these changes were being made in the shipping industry, the steam engine, boiler, and coal bin were put on wheels, hitched to a whole string of wagons and in but a few years created a whole new kind of land transportation which is represented by our modern railroad system. Again the great economic advance was more tons at higher speed.

The Diesel engine has had a somewhat similar history. The first engine made by Dr. Diesel, about forty years ago, was exactly like the large, slow-speed steam engines of that time, but he proposed to burn powdered coal inside the engine cylinder and thus use more of the heat in the fuel and eliminate the boilers entirely. It was soon found that it was easier to burn oil than powdered coal and thus appeared the oil-burning Diesel engine, much smaller, much lighter, and using less fuel than the steam engine. Its advantage of fuel economy in stationary installations was largely offset by the low price of coal as compared to oil so it made little progress. But in marine service, its reduced size and small bunker space gave it a marked advantage over steam.

Again the passenger and cargo vessels were hailed into dry dock, the steam engines, boilers, and coal bunkers taken out and replaced by oil-burning Diesel engines, just as the steam engine had replaced sails years before.

The economic reasons for this change were: less weight, less space, and less fuel for the engines and more room for cargo. The question now arises, why didn't the Diesel locomotive replace the steam locomotive as it did the steam marine engine? The answer is the same only not quite so apparent. It was too big and heavy.

The Diesel engine, like the gasoline automobile engine, will not pull below a certain speed so in order to use a Diesel engine for a locomotive, it is necessary to connect it to an electrical generator which in turn supplies current to electrical motors that drive the wheels. Thus, the weight of the generator and motors must be added to the weight of the engine when comparing it to a steam locomotive. Until very recently no such lightweight Diesel engines were available. It was here that General Motors entered the Diesel engine business.




In 1930 the Winton Engine Corporation and the Electro-Motive Company, of Cleveland, Ohio, were taken into the Corporation. Winton were building what were then considered lightweight Diesel engines and Electro-Motive had built a majority of the gasoline and distillate engine rail cars in the United States, hence were in a position to know something about railroad electric drive requirements.

These two organizations and the General Motors Research Laboratories have worked together during the past five years in the development of a new type of high-speed lightweight Diesel engine particularly adapted to railroad service. These engines represent not only Diesel engines and rail car experience but also automobile and airplane engine experience so that light weight has been achieved without sacrificing anything of ruggedness and reliability.

The performance of these new engines, the spectacular transcontinental run of one of the streamlined trains, the widespread activity in all forms of transportation are fine examples of the saying, "Necessity is the mother of invention".

In all this struggle to improve transportation, it will be observed that in each instance the weight of the engine has been reduced, less fuel required, the speed increased, and greater pay load carried. No amount of difficulty can stop progress in this direction.

If such a phenomenal gain can be made in the first attempt at light weight and higher speed, it is obvious that there is plenty room for further improvement and the fact that practically all the railroads and Diesel engine builders are working along this line insures that we are only near the front of the book. The last chapter is a long way ahead.

# He is Not a Business Man

*Article by H. E. T. Haultain, Professor of Mining Engineering*

Engineers will find some interesting and important lessons in the growth of the mining industry in Canada in recent years. Two features are prominent. Gold mining, the most fickle of all industries, has been, apart from the character of our people, the main stabilizing influence in these distressful times. The status of the mining engineer has been steadily growing in the industry and now all the larger mines are managed by engineers. One explanation can be found in the size of our mines and the amount of capital involved. Size alone may be a stabilizing influence. The technical complexity of the operations may be another but these are not sufficient. Information brought out from time to time has shown that large and technically complex business has had some most upsetting effects.

In mining, times have changed. Not so very long ago true words spoken in jest gave an indication of the generally accepted state of affairs. "A mine is a hole in the ground and its owner is a liar". "There are three grades of liars, the ordinary liar, the damned liar, and the mining expert". A generation ago boards of directors said they must have a "business man" as manager of their mine; he could easily "hire" all the engineers that he needed. Now they are learning that the temptations of the mining game may be too great for predatory instincts. Men are learning that there is much more in the engineer than scientific knowledge and technical experience. They are learning that there is something intangible, undefinable, but nevertheless very definitely there. They are beginning to learn to recognize its presence without being able to isolate it, much as the scientist detected the presence of his vitamins. He could at least recognize their absence. Engineers long recognized this something, tried to label it with a word long used by others with vague and differently understood meanings,—ethics. They spoke of professional ethics and tried to draw up codes of ethics. There are some words that the more you try to define them the less you understand them and some that to define is to kill. The efforts towards a code of engineering ethics was simply an effort to show the difference between the professional engineer and the "business man", to show that there were things that he would not do that his friend or his brother "business man" would do as a matter of course. Kipling expresses an underlying idea when he puts into the mouth of the engineer, "My fair wages I will openly take".

The mining engineer could so easily make many more dollars out of the effect of his report on the stock market than he receives as a fee and he could so this without any fear of detection. Likewise the mine manager; his salary, large as it often is, would be a trifle compared to what he could make out of the fluctuations in the market of his company's shares if he lent himself in a slight and entirely undetectable way to its manipulation.

Oh, yes! there are engineers and engineers. There are black sheep in every flock but they are black. They may appear as only slightly or occasionally suspiciously grey to the public because the education of the public has only begun; but to the engineering profession they are black, and easily recognized as such, even in the obscurity of some mining business. Unfortunately there is more than one example. We have had the case of a "mining man," accepted as an engineer by the press, who persistently voiced his optimism and his mining knowledge to the press while the stock market value of the property he controlled literally soared to high levels—only to crash at a later date. And here lies a difficulty. The engineers saw it all, recognized it but could do nothing. There was nothing legally wrong in expressions of optimism. There was no positive connection between the persistent newspaper interviews and the rise in price of shares. There was nothing you could do about it. But if this happened often mining would not have had the stabilizing effect that it has had. What are the safeguards? Legislation and the help of lawyers? Much has been attempted in this direction and much of great value has been successfully accomplished, more and more as the years go by, but apparently it is not enough. Lawyers are paid, very highly paid, higher than mining engineers, to circumvent the best efforts of other lawyers. The best answer lies in the inherent decency, the persistent tendency towards honesty, the rugged resistance to financial temptation of the engineer, and the education of the public along these lines. It is well on the way here in the Canadian mining industry. The mining engineer is being paid much higher salaries, not a few of them more than twenty-five thousand dollars a year, mainly because he has not that predatory instinct of some of our "captains of industry".

But honesty, honourableness is a better word, is not sufficient in itself any more than is technical ability. Nor are these two sufficient. Mining is essentially a business. Unlike some other engineering work the only reason for its existence is the making of a financial profit or the reasonable hope of such profit.

The engineer should understand business methods, both good and bad, the useful and the predatory. He should be able to talk to the business man in his own language. He should show him that he understands his point of view. He should not only understand and practise all the mechanisms of handling and recording monetary transactions in the routine of paying for labour and goods, but he should understand something of the higher problems of economics; of credit and finance. The present generation of mining engineers are showing, probably more than any other branch of engineering, that the engineer's attitude of mind and approach to his problems can as readily be turned to the best understanding and practice of sound business methods as to his more complex technical problems. But it takes some doing. It does not come naturally. When the engineer does learn business methods, good and bad, he will practise the good, and the stature of the individual engineer and the status of the profession, to use Carswell's excellent distinction, will grow.

# Safety First Methods Underground

*Adapted from a paper by S. G. Ireland '35, presented before the Toronto Branch of the Canadian Institute of Mining and Metallurgy, February 23rd, 1935*

The expression "safety first" has become a very common one in our present vocabulary. Due to the high speeds of our present motor cars, many attempts are being devised to make driving on our highways safe. Even the aeroplane is now considered reasonably safe for passenger traffic, and many other examples of increased safety devices could be mentioned. Many years ago, working underground was considered to be one of the greatest hazards. But even the insurance companies are now recognizing that the danger in working underground has been much lessened in fairly recent years. Safety first ideals have probably taken a greater hold on mining methods than in any other branch of the industrial world.

First of all, let us consider the workman himself. The mine manager, underground superintendent, captain, or shift-boss, may exercise all of their influence toward safety first methods; but, generally speaking, the safety of the workman depends on the workman himself. Hence, every possible means should be used to have the miner realize that he must be careful.

As a subdivision of this heading, let us consider in the first place the health of the workman. It is definitely known that ill-health makes us irritable and unfit for work. In these days of deep mining, ventilation is playing a very prominent part in mining methods. It is almost impossible to keep the air at low depths sufficiently pure for good working conditions. As a result, the miners working in such places for a considerable length of time become burnt out, and they become careless. Hence, it is a very good plan to change the men around. After a man has worked, say six months on the lower levels, he should be transferred to the upper levels, and thus replace an upper level man. By means of this interchange, the miners not only acquire a broader view of mining, but they are kept in a healthier condition—in a condition where they are less susceptible to carelessness.

The system of having each miner physically examined every six months at least is certainly an excellent one. In this way, silicosis may be detected before it is too late, losses of weight may be determined, and a healthier brand of miners can thus be maintained.

When a man is working on a contract or bonus basis, he is ever working against time. He knows that he must do a certain amount of work each shift to get a good bonus cheque at the end of the period. But he also knows that there are certain parts of his work, such as scaling in a stope, which do not boost his bonus cheque. Therefore he may take a chance and neglect doing this necessary work. In such cases the bosses should be insistent that safety be ensured.

We are all familiar with the statement that "a chain is just as strong as its weakest link". So the efficiency of the miner's work varies directly with the satisfactoriness of the equipment which he uses. Practically any machine man takes pride in knowing that he can drill off a good round each shift. But if he is given a poor machine or can't get enough steel, what is the effect on him? He gets flustered, erratic, and in a very bad mood. And when he gets in such a mood, that is just the time when he gets more careless, and is more liable to get injured. Underground work probably demands good nature and coolness more than any other branch of industrial life.

A good shift-boss is a great asset to any mine. Not only is he of great assistance in keeping the mill wheels turning, but he is ever on the "qui vive" for danger to his men. Let us see just what methods he adopts in fulfilling the safety first principles. Primarily, the shift-boss must know how to pick his men. There are certain jobs underground that are far more dangerous than are others. An excitable or dull-minded miner should never be sent to drill a round off in a raise. A man with good judgment, keen senses, and mental alertness should not be kept mucking long; he is the man needed for the places that demand skill and carefulness. Very, very seldom does the shift-boss send a man to work alone. In such a case, the miner's lamp may fail, or he may be caught under "loose" and buried, unknown to anyone.

The shift-boss should see that careful guarding is practised during blasting operations. For instance, in the author's experience, one man who was allowed to walk unmolested past a chute in which two sticks of powder were blasted. As a result, he lost the sense of hearing in one ear. That would never have happened if the chute blaster and his helper had been educated to do their duty.

The shift-boss should insist that men work safely. If, during his morning call, he tells a machine man to scale down tight the roof of the stope, he should make it his business to see that his orders have been fulfilled when he comes back in the afternoon. Such jobs as this may cut into their bonus pay, but, after all, it is for the good of the workmen themselves.

A shift-boss should not be a "driver". He should be a man who has worked a great deal underground, who knows his work, knows what a fair day's work is, and, lastly, who knows the dangers that he must induce his men to avoid as much as possible.

It is only in recent years that safety first engineers have been appointed in mining. But, in the author's opinion, there should be a staff of at least two safety first engineers in every mine of average size under production. These men should not only have a great knowledge of mining methods, but should have engineering ability to plan and supervise safety devices in very part of the underground work. With the advent of deep mining, not only is the ventilation problem greatly aggravated, but in many cases, the terror of the miner, namely, "loose rock", becomes almost unmanageable. Air blasts, resulting sometimes in hundreds of tons of rock caving in unexpectedly, cause many tragedies. Who, among the supervisors

of underground work, should be directly responsible for seeing that preventative means are taken to avoid such terrifying results? In the present period of history, preventative medicine has become a close partner of remedial medicine. And so, in mining, I am firmly convinced that we need in all of the average and larger sized mines this special staff of safety engineers. We need such men with a very keen observation of imminent dangers, who feel a great responsibility in seeing that every possible means is used, within reason financially, to make mining on the deep levels and in the deep stopes almost as safe as on the top levels. The shift-boss is too busy trying to keep the mill running to have time to visualize all of the safety measures necessary. Let us see some of the ways that such a staff of engineers can stimulate into the hearts of the miners these principles of safety first.

In a few of the mines to-day, a blackboard is kept in the dry house which records the number of accidents occurring each day for the whole period each month. Some mines, especially the larger ones, tabulate the names of the underground captains, giving the number of men injured each day, working under these captains. These accidents are classified into compensation cases, minor accidents, and fatalities. Such a system well planned by the safety first department seems to work wonders.

Further, the results of experiments made with blasting caps and dynamite may be exhibited advantageously in the dry or shaft-house where the miners can see them. Pictures that are self-explanatory of accidents that occurred due to carelessness can be posted up on the notice board. Each picture should have the heading, "safety first". Such a safety first campaign undoubtedly has a great effect on limiting the number of accidents underground.

Two main features of mining are necessary for the prevention of accidents, namely, cooperation of all of the miners and the staff, and proper education of the miners themselves in the principles and methods of safety first. Good partnership is well illustrated in proper mining methods. Proper equipment, efficient shift-bosses, and capable safety first engineers are all a necessity. But, the essence of a true partnership lies in the cooperation of the miners among themselves, and of the miners with the shift-bosses, captains, underground superintendent, safety first engineers, and mine manager, all striving toward a common objective—that of working comfortably and safely, efficient in every respect. May such co-operation continue and even increase in our mining camps in the years to be.


ENGINEERS

1935

# YEAR BOOK

OF THE

## UNIVERSITY OF TORONTO ENGINEERING SOCIETY


FACULTY OF APPLIED SCIENCE
AND ENGINEERING

UNIVERSITY OF TORONTO


# ENGINEERING SOCIETY EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

# The Orchid Club

The signal honour of being made honorary members in the Orchid Column has fallen on the shoulders of a number of the lads of the graduating class. An orchid to:

Don Ritchie, whose interest in the Engineering Society has been almost unprecedented in the annals of School. It should be noted that Don has also maintained the custom of taking unto himself a wife.

"Ball of Fire" Edward for his M. & M. Club, his Transactions and his "lucky streak". Bruce's epic "love life" alone deserves him of mention here. My, my.

Ron Gorrie, and his chum, Jun Mills, for the best-run Club of the year. Worry, worry.

Frank (The Stooge) McCarthy, for the high pressure methods he used in selling Engineering Society Meetings, School Dinner tickets, and synthetic gin. The worthy gentleman is also a graceful exponent of the noble terpsichorean art; we recall an exhibition before Dean Mitchell at a second year party. His Winchell-ism and seductive bass voice are, it is rumoured, two reasons for his popularity with a certain brunette. "I am ashamed of myself—woo-woo-woo-woooooh".

"Stormy" Webber, for winning the Bronze "S" in spite of time taken up in Rochester trips. And they say a cookie-pusher is a man who is mentioned in "Over the Teacups".

Bill Armstrong, that staunch Epescopoolian from Cinncinapolis, Pennsytuckia, who ran off the parties so smoothly and well.

"Schoolboy" Hawker, who figures he can hit as hard as "Ike" Boone and run faster.

Jack Powlesland, for raising the status of the Civil Club from 00 to 100 in a year. Nice goin', suh.

"Parks" Parkin, for the most novel and entertaining club dance of the lot.

"Rosie" Farrar, for the Graduation Ball, the best of its kind ever held.

John Layng, for his work on Torontonensis. But we still like Gothic architecture.

Lorne Baker, the busiest and most energetic Club Chairman of the lot.

# Election Results

Friday, March 1, 1935

## ENGINEERING SOCIETY

*President*.....W. M. Lawrason
*First Vice-President*.....C. E. Burnett
*Second Vice-President*.....H. N. Potter
*Treasurer*.....L. C. Foster
*Secretary*.....G. F. Beard

## ATHLETIC ASSOCIATION

*President*.....R. A. Boyle
*Vice-President*.....C. L. Denison
*Secretary-Treasurer*.....A. Uppep
*3T6 Representative*.....W. H. Barber
*3T7 Representative*.....W. M. Hogg
*3T8 Representative*.....J. D. Fox

## CLUB CHAIRMEN

*Architectural Club*.....K. Barker
*Chemical Club*.....F. O'Flynn
*Civil Club*.....J. G. Welsh
*Debating Club*.....A. DeMaio
*Electrical Club*.....F. A. Fleming
*Mechanical Club*.....W. F. Taylor
*Mining and Metallurgical Club*.....W. T. Turrall

## PERMANENT EXECUTIVE 3T5

*President*.....R. Hewitt
*Vice-President*.....F. S. McCarthy
*Secretary-Treasurer*.....M. Willer
*Councillors*.....L. P. Baker
L. J. Brenzel
A. P. Dawson
F. R. Gorrie
R. R. Finlay
J. W. Powlesland

## EXECUTIVE 3T6

*President*.....G. E. Smith
*Vice-President*.....G. O. Loach
*Secretary-Treasurer*.....C. A. Miller

## EXECUTIVE 3T7

*President*.....J. V. Leworthy
*Vice-President*.....R. E. Young
*Secretary-Treasurer*.....D. M. McBane

## EXECUTIVE 3T8

*President*.....J. R. Millar
*Vice-President*.....G. Richards
*Secretary-Treasurer*.....M. R. MacPherson

## BRONZE 'S'

R. A. Webber

# Elections

School's traditionally great election day proved no exception this year, and the shouts, threats and promises were only exceeded in sincerity and volume by the ballots cast. On Tuesday the nominations came fast and furious, with many last-minute entries (as usual). As a result, the slates put before Schoolmen for voting the following Friday contained the names of many strong candidates, and the offices were closely contested.

That long to be remembered election week really was started off with a bang by a lively election speech meeting on Wednesday afternoon at 4 o'clock in C22, where standing room was hard to find, and the deepest silence reigned throughout.

Then promptly at 5 o'clock the pleadings, cajolings, and showmanship of eighty-two earnest candidates were let loose. Signs of all sorts, enjoining the support of loyal Schoolmen "for the best man" appeared in no time from clock to campus and wall to walk.

Then came Friday! At 12 noon, a long line of enthusiastic Schoolmen paraded from the Red Schoolhouse to Hart House; between shouts from these Engineers, other Faculties claim Highland music could be heard. Promptly at 1, pepped up by a superb luncheon in the Great Hall, followed by a quiet chat in the East Common Room, the return to the polls was begun.

From 1 o'clock till 2.30 the polls were surrounded by eager Engineers, and the latter by eager candidates. Then at 2.30 the voters, figuring too much of the afternoon already past to warrant their profiting by attending Labs. or lectures, dispersed to make the best of a great day. So from 2.30 till 3.00, when the polls closed, the R.O's had nought to do but picture themselves for the next few hours. "There were millions of 'em", to quote one candidate, though he was not referring to ballots, nor were the R.O.'s thinking of jokes.

The ballot counting was progressing very well, while the erstwhile voters enjoyed themselves at tug-of-war, jerry exciting or rather very exciting chariot races, and ball games in the big gym.

The celebrators partook of food at nine in the Great Hall, and then the results were flashed on the screen.

Perhaps some thought about studying after that, but what a night for not-studying! Plans for the evening made long before were joyfully recalled, and then every citizen for himself!

Schoolmen are to be congratulated on their splendid support and school spirit manifested that day, of which the passing of the Athletic Referendum is a special instance. School tenders its thanks and congratulations to the retiring Executive, who ask that the same support they received be given the new Executive. May School be bigger and better than ever in 1935-36!

S. G. Farrar,
*Chief Returning Officer.*

PROF. T.R. LOUDON
HON. VICE CHAIRMAN

PROF. C.R. YOUNG
HON. CHAIRMAN

J.W. POWLESLAND
CHAIRMAN

PROF. W.M. TREADGOLD
HON. VICE CHAIRMAN

C.C. HOAG
VICE CHAIRMAN

# CIVIL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

R. HEWITT
4TH YEAR REP

J.G. WELSH
3RD YEAR REP

W.M. HOGG
SEC. TREAS.

D.G. WILMOTT
2ND YEAR REP

E.A. RUSSELL
1ST YEAR REP

# The Civil Club

The primary function of the Civil Club is to promote lasting acquaintanceship among the members of all years in Civil Engineering for the present and future mutual advantage of each.

The secondary function, although of almost equal importance, is to bring to the members of the Club, men of high engineering ability in order that valuable knowledge and information in the field of engineering may be obtained.

As far as possible both these functions were combined in each meeting.

The year opened with an extraordinarily successful dinner of almost 100 per cent. attendance, on October 18th. The speaker was the eminent bridge engineer, Mr. Frank Barber.

On November 1st, the Club had an interesting and instructive trip to the plant of the Bethlehem Steel Corporation, Lackawanna, New York.

December 12th was the occasion of an evening meeting, which was more than well attended. An exceedingly interesting talk, illustrated with slides, was given by Mr. Norman D. Wilson on transportation and other engineering problems in South America and Mexico. Food, ice cream and cider were furnished in abundance.

The apex of social events was reached on January 8, 1935, with a dance held jointly with the Mechanical Club at Malloney's Art Gallery. It was acclaimed by everyone of the large number present to be one of the most successful dances they had ever attended.

With this imposing list of successful events behind them, the executive have still on their calendar plans for noon luncheons with good speakers, which will be a new departure in Club activities, and one big final dinner at the Engineers' Club.

The executive wish to offer their heartiest thanks to each member of the Club for their loyal support of each function, and also to the professors who have given unstintingly of their time and co-operation.

The best of good luck and wishes to each of you for success in the future.

J. W. Powlesland,
*Chairman.*

FOURTH YEAR CIVILS

*Back Row*: L. J. Russell, J. L. Cruickshank, J. B. Bryce, N. S. Haines, H. B. Paterson, D. B. Sommerville, H. A. Hornfelt, W. E. B. Parker, D. B. Thomas, G. S. Sutherland.

*Third Row*: A. C. King, H. M. Treleaven, R. E. Brobst, E. R. Graydon, E. V. Tidman, A. J. E. Smith, R. G. Westheuser, R. E. N. Davey, S. H. Pallett, J. A. C. Bowen, W. R. Alexander, S. K. Brigham.

*Second Row*: G. M. Robinson, Prof. W. J. Smither, R. Hewitt, Prof. C. R. Young, J. W. Powlesland, Prof. W. M. Treadgold, M. A. Cooper, Prof. T. R. Loudon, J. K. Jones.

*Front Row*: W. D. Johnson, Z Sverdlik, R. F. Gross, H. G. Worley, F. B. D. Arnold.

FOURTH YEAR MINERS AND METALLURGISTS

*Front Row*: Prof. J. T. King, Prof. J. A. Newcombe, Prof. G. A. Guess, Miss V. A. Jordan (Sect.), Prof. H. E. T. Haultain, Prof. F. C. Dyer, Prof. J. E. Toomer.

*Second Row*: D. C. Chisholm, A. P. Dawson, R. E. Neelands, J. H. Atkinson, B. G. Edward, S. G. Farrar, C. J. G. McCracken, J. N. Lilley, S. G. Ireland.

*Third Row*: Mr. S. E. Wolfe, E. A. Perry, L. H. VanLoon, I. A. Usher, F. W. Hore, P. F. Grieco, D. A. Pirttinen, Mr. J. Anderson.

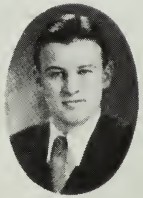
W T Turrall
SECY - TREAS.

Jos. Errington
HON. CHAIRMAN

B.G. Edward
CHAIRMAN

P.F. Grieco
VICE-CHAIRMAN

J.H. Atkinson
4TH YEAR MINERS



J. C. Stavert
3RD YEAR METALLURGISTS

# MINING AND METALLURGICAL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

D.M. Gilpin
3RD YEAR MINERS

F. A. Shaw
1ST. YEAR METALLURGISTS

J. L A N G
2ND. YEAR MINERS

P E Cavanagh
2ND. YEAR METALLURGISTS

M.A. McPherson
1ST. YEAR MINERS

# Mining and Metallurgical Club

Looking back over the activities of the past year, Miners and Metallurgists have good reason to be proud of the organization to which they belong. In the past the M. and M. Club has been characterized by the unity evident in its members and the excellence of its functions, and in this, the twentieth year of its existence, we believe we have maintained and added to the record of previous years.

At the outset, we were more than fortunate in obtaining Mr. "Joe" Errington, President of Little Long Lac Gold Mines, as our Honorary Chairman. Mr. Errington has always been an enthusiastic follower of our organization and during his term of office has been a source of real inspiration to your executive.

Following the time-honoured custom, some fifty-six Frosh were instructed in the mystic rites of the Club at the Freshman smoker on October 6th. Each man was required to produce his credentials and the amusement thereby created was considerable.

The Inaugural Dinner was held late in November at the Engineers' Club with our Honorary Chairman as guest speaker. The largest turnout on record—an even hundred—listened enthusiastically to Mr. Errington's stories from his own personal experience. The gist of the speaker's address was that a technical education is your most valuable asset in industry.

On December 1st members of the Club were the guests of the Toronto Branch of the Association of Women of the Mining Industry at their annual tea-dance. At this delightful function M and M'ers were provided with an abundance of food and pretty girls and the result was more than satisfying.

This was followed by the third annual M. and M. At-home on January 10th. On that festive eve, amid the atmospheric surroundings of Malloney's Art Galleries, some seventy Club members and the "Flower of Toronto's Young Womanhood" swayed rhythmically to the syncopations of Clarke Isbister and his band. An unusual programme, rations at half-time, and the presence of Professors Haultain and Guess and their ladies made the evening one long to be remembered.

On February 6th the Engineers' Club once again served as a background for a dinner meeting. On this occasion "Bob" Bryce, President of Macassa, told, in his inimitable manner, of his trials and tribulations in achieving his present position. The subsequent open discussion made this dinner one of the most outstanding in the Club's history.

Members of the Graduating Class were the guests of the Toronto Branch of the C.I.M.M. at a students' meeting held on February 23rd at the Engineers' Club. Papers were read by three Toronto men and by representatives from Queen's and McGill. Messrs. Ireland, Grieco and Atkinson are to be congratulated on their excellent work.

The final meeting of the year was in the form of a dinner given the Club by our Honorary Chairman, Mr. Errington. Men from the industry were there in force and their sage remarks will long be remembered by our members. Thus was a fitting climax brought to an excellent year!

Throughout the year the enthusiastic support given our functions by the undergraduate members has been a source of real gratification to the executive. We are also grateful to those members of the Faculty Staff who have so kindly taken an interest in our activities. To Messrs. Balmer Neilly, Bob Bryce, Walter Segsworth, C. G. Williams, C. E. MacDonald, Richard Pearce, and Joe Errington, our Honorary Chairman, we offer our sincere appreciation of their efforts in our behalf.

To Bill Turrall, your new Chairman, and his executive we offer our congratulations and every good wish for the future. The best we can wish them is that everything is—just a Ball of Fire.

Bruce G. Edward,
*Chairman.*

FOURTH YEAR MECHANICALS

*Top Row*: E. D. Heller, G. R. Angle, J. H. Larkworthy, W. J. Robson, W. A. Wallace, F. W. Jones, F. R. Adams, C. E. Bennett, R. S. Segsworth, H. G. Hill, D. G. McGorman.
*Third Row*: J. S. Kennedy, W. H. Carter, R. E. Smallwood, W. W. Freeland, G. R. Black, G. A. Marten, M. Willer, F. A. Reid, R. J. Birss, J. F. Mitchell.
*Second Row*: G. W. Wurts, A. J. Dewdney, W. A. Campbell, W. T. Thompson, C. L. Torry, J. S. Edgar, D. C. R. Miller, G. A. Wright, J. J. Hickey, J. B. Douglas, D. G. Billings, A. S. Drummond, W. H. Pellett.
*Bottom Row*: E. B. W. MacRobie, D. R. Elliott, Prof. W. G. McIntosh, Prof. R. Taylor, Prof. R. W. Angus, Prof. E. A. Allcut, L. P. Baker, K. C. H. McNichol, W. J. J. Blackhall.
*Absent*: G. E. Boyce, D. S. Holmested.

PROF. A. TAYLOR
HON VICE CHAIRMAN

L. P. BAKER
CHAIRMAN

PROF. E. A. ALLCUT
HON CHAIRMAN

PROF. A. W. ANGUS
HON VICE CHAIRMAN

J. MILLER
VICE CHAIRMAN

# MECHANICAL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

I. HAMER
SEC. TREAS

J. HICKEY
4TH YEAR REP

F. TAYLOR
3RD YEAR REP

H. MINAKER
2ND YEAR REP

J. SOULIERE
1ST YEAR REP.

# The Mechanical Club

Another year has rolled by during which the Club has held many enjoyable and educational functions.

Our activities began with a smoker and luncheon at Hart House early in October. Professor E. A. Allcut, our Honorary Chairman, presented a very interesting talk on "Inventors and Inventions".

On October 19th, the Fourth Year Mechanicals, together with the Electricals, held their annual trip to the power-generating plants at Queenston and Niagara Falls. This trip was highly instructive and is something for the third year men to look forward to. A week later successful arrangements were made for the third year Mechanicals to visit the Huntley Steam Power Station and the Bethlehem Steel Works at Buffalo. The steam plant was particularly interesting.

The second year men visited the Kodak plant at Weston and at the time of writing plans are going forward for them to take another local trip.

A second smoker was held in the latter part of November with Dr. E. D. MacPhee as the speaker of the evening, his subject being "Management Engineering". This talk was greatly appreciated as this subject is quite important to the engineer after graduation.

On January 8th an "At-Home" was held jointly with the Civil Club. This innovation was very successful and augurs well for future years.

At time of writing plans have been made for the Annual Club Dinner to be held at the Engineers' Club on Tuesday, February 19th. Major Anthes, of the Anthes-Imperial Company, is to be the guest speaker, the topic being "The Relation of the Mechanical Engineer to Present Civilization".

The first year trip is to take place this month (February), after which the final smoker of the year will be held and the activities will cease for the present.

In advancement of the activities of the Mechanical Department a student branch of the American Society of Mechanical Engineering was founded for the purpose of keeping in touch with recent advances in present-day engineering. General meetings have been held with talks by Mr. Ellis on "Steel Hardness Testing", Mr. O. Holden on "The Development of a Hydraulic Power Site", and Mr. W. Carriere on "Air-Conditioning". These meetings have been of a technical nature and are proving to be quite popular as is indicated by the rapid increase in membership.

L. P. Baker,
*Chairman.*

J V LEWORTHY
SEC TREAS

V B ROSS
CHAIRMAN

PROF. H W PRICE
HON. CHAIRMAN

F A FLEMING
VICE CHAIRMAN

R R FINLAY
4TH YEAR REP.

# ELECTRICAL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

G A RICHARDS
1ST YEAR REP

R A BOYLE
3RD YEAR REP

W J KING
2ND YEAR REP

# Electrical Club

The seventh year of the Electrical Club's activities has been brought to a close. This year has not been inferior to any in the past, but has rivalled, if not surpassed, previous years both in diversity of programme and quality of social entertainment. The unrelenting enthusiasm of each member of the executive has made this division of the Engineering Society a progressive Club, always alive to the events of the day, and a Club of which every student in Department 7 is proud to be a member.

Following a precedent, as old as the Club itself, the power plants along the Niagara River were visited early last October. The Hydro-Electric Generating Station at Queenston was the chief point of interest. So large a power house can seldom be found; and those visiting it for the first time were much impressed by the size of both the building and of the machines which it contained. The Schoelkopf Station at Niagara Falls, N.Y., and the C. R. Huntley Station in Buffalo were visited on the same day. That night most of the Fourth Year visited the theatres in that city; and their outlook on life was broadened thereby. Due to the limited space in the bus, the Toike Oikers left Buffalo much the same as it was when they found it.

At a meeting held in Hart House, Mr. C. W. Woodside gave a talk on "Germany", a subject which is of great interest at the present time. He had spent some time in that country, and therefore was able to give information obtained first hand. Later in the year, Mr. B. de F. Bayly addressed the Club, and outlined "The Future of Communication" in an interesting and imaginative manner.

The dance held by the Club in January at the Savarin restaurant was a complete success. On March 5th, Mr. T. Stewart Lyon of the Hydro Electric Commission, was the guest speaker at the Electrical Club dinner, held in the Engineers' Club on Bay Street.

Both the social and the semi-educational functions of the Club have been a means of strengthening the goodwill between its members. The lectures and laboratory experiments have brought us more closely together, and friendships have been made which will continue to brighten our student days. These amicable associations and valuable personal contacts that we have formed will not be lost, even after graduation.

V. B. Ross,
*Chairman.*

FOURTH YEAR ELECTRICALS

*Back Row*: J. R. Gammage. J. E. Coutts, L. S. Todd, J. R. Warren, H. J. McKee, H. B. Charters, G. A. Leslie, H. A. King, D. J. McIntyre, J. L. Jowsey, J. R. Baker.

*Third Row*: A. H. Sievert, J. A. Campbell, J. M. Duncan, J. A. Pratt, L. W. Wyse, A. W. Howard, D. N. Cooke, R. J. West, T. W. Moore, W. J. Sealy, H. J. Wilkinson, J. E. Forsyth.

*Second Row*: Prof. H. W. Price, R. R. Finlay, E. A. Ricker, W. M. Taylor, G. M. Wright, W. F. McMullen, E. T. Wilkins, L. Wallender, R. E. Santo, W. Blake, C. C. Bryant, R. A. Elderkin, J. B. McGfachie.

*Front Row*: J. L. Looney, J. L. Fair, C. G. Levy, H. B. Tinianov, R. M. Robinson, Prof. T. R. Rosebrugh, V. B. Ross. V. Shanks, Ass't Prof. V. G. Smith, Assoc. Prof. A. R. Zimmer, Mr. R. I. Brown, Mr. M. Ward, Mr. H. R. Sumner.

*Absent*: A. C. Anderson.

FOURTH YEAR CHEMICALS

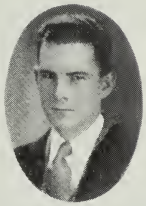
*Front Row*: W. J. Cook, T. A. Luscombe, Prof. E. A. Smith, Prof. E. G. R. Ardagh, Prof. J. W. Bain, G. W. Cairns, Dr. R. R. McLaughlin, Prof. L. J. Rogers, S. J. Spall.

*Second Row*: R. J. Labelle, W. E. H. Brawley, W. N. B. Armstrong, S. Silver, K. R. Hymmen, W. G. Armstrong, V. M. Norwood, J. W. Wright, N. H. Cale.

*Third Row*: F. C. Richardson, A. G. P. Pickford, M. B. Rowbotham, A. B. Lockley, E. H. Wolfe, J. W. Boegel, J. R. Mills, F. R. Gorrie.

*Fourth Row*: G. H. Fetterley, W. A. Mohun, G. L. Keith, A. B. Ridley, E. R. Wand, A. B. Rosenberg, F. S. McCarthy, H. S. Dando, J. P. Hooper, R. C. Craufurd, P. H. Hawker, R. A. Webber, D. G. Ritchie.

*Fifth Row*: G. W. Mills, J. F. Reid, W. R. Cale, W. R. Smith, E. B. Storey, E. W. Wadge, T. B. L. Young.



J.P. Mc Millin
SECY - TREAS

G.E. Lee
VICE CHAIRMAN

Prof. E.G.R. Ardagh
HON. CHAIRMAN

F.R. Gorrie
CHAIRMAN

Dr. R.R. McLaughlin
HON. VICE CHAIRMAN

# INDUSTRIAL CHEMICAL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

G.W. Mills
4TH YEAR REP.

K.O.T. Beamore
2ND YEAR REP.

F.M. O'Flynn
3RD YEAR REP.

A.T. Waddington
1ST YEAR REP.

M. Mc Murr[illegible]
[illegible]

# The Industrial Chemical Club

The activities of our Club have been quite numerous this year and in all cases have been very well supported. This has been due entirely to the close co-operation and whole-hearted support of the executive of the Club. The work of "Jun" Mills on the Chemical Club dance and of Jerry Lee on the Chemical Club booth at School Nite are of special mention.

The first smoker of the Fall Term was held on October 4th, 1934. At this smoker, some of our last year's graduates and some of our Fourth Year students told of their experiences during the summer. This was rather an innovation and I am sure all those present thoroughly enjoyed the talks.

At our next smoker, Mr. C. R. Conquergood, of the Canada Printing Ink Co., addressed the Club. His subject, "Colour", was most fascinating and it was a subject we come in contact with every day and which we treat very lightly.

The third smoker, on November 27th, was addressed by Mr. W. E. Appleyard of the Canadian Kodak Co. He added a unique feature, in that he illustrated a very instructive address on "The History of Photography" with two hours of motion pictures.

One of the big events of the Fall Term was the annual excursion of the second, third and fourth years to the Niagara frontier. The plants visited were:—the Ontario Paper Co. at Thorold, the Guaranty Silk Dyeing & Finishing Co. at St. Kitts, and the American Cyanamid Co. at Niagara Falls. A few of the men pursued further studies in Buffalo. Needless to say the "Gayety" and "Danceland" were much enjoyed. (Stop the car, Ritchie).

The concluding function of the Fall Term took the form of a dinner, held at Coles', College Street. Dr. A. E. Cliffe of Standard Brands, Ltd., the principal speaker, gave an interesting account of his experiences as a chemist and engineer.

To usher in the Spring Term, an informal dance under the kind patronage of Mrs. R. R. McLaughlin and Mrs. E. A. Smith, was held at Malloney's Gallery and was greatly enjoyed by those who attended.

The Chemical Club's contribution to School Nite entertainment was that doubtful quartette, "The feeble four from fourth year".

On February 5th, the first smoker for the spring term was held at Hart House. It was the pleasure of the Club to hear Mr. McLeod of the Canada Packers, Ltd. Mr. McLeod chose as his subject "The Hydrogenation of Vegetable Oils".

The last activity of the Club was a dinner at Hart House, March 13th, 1935. It was our privilege to hear Mr. W. J. Cairns of the Bell Telephone Co., Ltd. Mr. Cairns outlined briefly some of the more worthwhile things in life. He said that success could not be measured in dollars and cents but is rather measured in one's own

happiness and the ability to make and retain lasting friendship. Mr. Cairns gave us a new outlook on industry, which he has obtained through many years of practice in industry.

In conclusion, may I take this opportunity of thanking the members of the staff of Chemical Engineering, and the members of the Executive who have given such valuable help and co-operation.

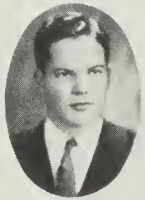
And to the next year,—I wish you the best of success, which I am sure you will have under the able guidance of Frank O'Flynn.

F. R. Gorrie,
*Chairman.*

FIFTH YEAR ARCHITECTS

*Front Row*: W. G. Armstrong, J. A. Layng, F. G. M. Winter, Miss P. W. Cook, G. A. Cowper-Smith, H. L. McQuire, J. I. Brenzel, Prof. H. H. Madill.

*Back Row*: H. K. Black, Mr. W. E. Carswell, Mr. M. Waters, Prof. E. R. Arthur, Prof. H. J. Burden, J. B. Parkin.



W.A. Salter
SEC. TREAS.

A.J.H. Barker
VICE CHAIRMAN

J.B. Parkin
CHAIRMAN

F.A. Wickson
HON. CHAIRMAN

J.I. Baenzel
5TH YEAR REP.

W.A. Ramsay
2ND YEAR REP.

# ARCHITECTURAL CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

F.N. Smith
3RD. YEAR REP.

F. Meschino
1ST YEAR REP.

W.H. Gilleland
4TH YEAR REP.

# Architectural Club

To record the activities of a Club in a manner which will arouse even slight interest is a rather difficult job. For we merely review events with which each one of us is already well acquainted. However, as this duty befalls us, we call to mind the words of that great architect, "Batty" Langley. "Honi soi que mal y pense"—architecture expects every man to do his duty (those are not his words but our own). Therefore, we are firmly resolved, and do pledge ourselves to the best of our ability to recount truly, all doings, activities, occurrences, happenings and events of the above-mentioned Club.

As far as the banquet is concerned we can speak quite favourably, offering only one comment, which is, we should like to go on record as having said that the Freshmen have not put on such poor showing since the invasion of the hordes of 3T5. In direct contrast to this our freshman professor put on an excellent show for which we award a first mention (medals seem to be rather scarce).

The very words Mauvais Arts bring a feeling of sheer joy to the heart of each one who was fortunate enough to be present. Modesty will not permit us to go into the gory details, but let us merely say, "When better parties are held the Architects will hold them."

As yet we are unable to apprehend just why our professors (who were three-quarters there, referring to number present, of course) found it necessary to assume a "Smith Brothers" disguise. Perhaps it was the fear of the rumoured shot-gun criticism.

"Singers supplied for all occasions. (A.R.P. Advt.)"

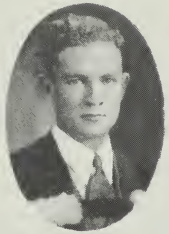
With due ceremony on January 15th we received the charter marking the formation of the Student Chapter of the Ontario Association of Architects. If the results of this action equal expectations the student body will benefit considerably. Remember each one (who has paid his fees!) is a member of this chapter and helpful suggestions are welcomed by the executive.

It is only fitting that we mention the hockey game. For it is to 3T5 that credit for the institution of this annual event must go. So to their ever increasing list of achievements (which include practically everything save architectural endeavours) we must add their unbroken claim of victories.

So we come to the end of our account. But alas and alack and alackey, we had hoped to mention each one of the illustrious graduation year. Failing this we therefore transmit to every architect a message in code. "Mr. Brenzel, asked to leave the country, grew angry and after giving the "Black Cook" old "Harry" socked her on the "Bill", flew the "Coop" and was found in the "Parks" singing Auld "Layng" Syne.

Woo-Woo and Woo!

J. B. Parkin,
*Chairman.*



R. HEWITT
VICE-CHAIRMAN

PROF. W. J. WRIGHT
HON. CHAIRMAN

AUSTIN KING
CHAIRMAN

J. FAIR
SEC.-TREAS.

V. PARISH
1ST YEAR REP.

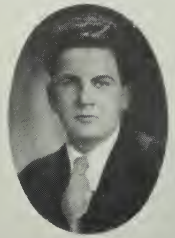
# DEBATING CLUB EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

J. BOWEN
4TH. YEAR REP.



M. F. CARRIERE
2ND YEAR REP.

A. DE MAIO
3RD YEAR REP.

# Debating Club

"Dear Aunt Susie:—

I was very pleased to receive the fluffy long undies, they make me feel awfully cosy. I am getting on just fine at college.

Oh yes, you asked me about our Debating Club, didn't you? I told you I was the Chairman, didn't I? Say, it's just too dilly for words! I sit up at the front table all the time and look important. All the freshmen think I'm a "big shot" (I swear I don't know what that means, but the Miners use it so I guess it can't be a "bad" word).

But we have debated "The Amalgamation of the Railroads" which was carried; "Liberalism though yet speaketh, is dead", which was defeated; "This city needs more gentlemen signs", which was also carried, and many such subjects. Upon learning our decision upon these matters, Mr. Beatty said he would send enough graft up to Ottawa to pass the bill right away, Mr. Hepburn was elected and we—I mean, they—got all the beer they wanted. So you see we exert some influence.

We held debates and discussions at the rate of three a month and an oratorical contest, all before Christmas. Then we had the Inter-year Debating series. Mr. Johnson and Mr. Hewitt, fourth year, defeated Mr. Carriere and Mr. Tipple, second year, on a debate on a revised calendar. It was a heated discussion on dates, which I don't know anything about, for as you know I never play with the girls. I must tell you though, in the labs when the boys think I'm not listening they talk about "hot numbers", and "torrid babes"—I just know they're talking about co-eds. Oh! I just don't know what would happen if I were alone with one of them. But I will be careful not to let any pick me up.

Well, our Club does accomplish considerable, as an extra-curricular activity it provides a course of tremendous academic value, which must be omitted from our already very full curriculum.

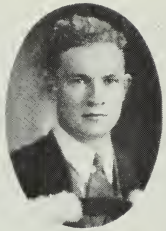
Our programme concluded with a gala evening—the Final Inter-year debate—Third defeating Fourth upon the subject of "Government Owned and Operated Markets". This was followed by the last oratorical contest won by W. D. Johnson, H. L. Tipple and J. Bowen in that order. The evening finished with refreshments in the Great Hall—and "a fine time was had by all".

We feel that the Club has performed its function in "School" this year as in other years, but would do so more fully with better support of the undergraduates of S.P.S.

A. C. King,
*Chairman.*

J. W. Powlesland
COUNCILLOR

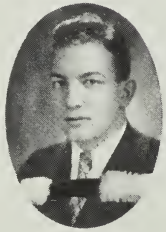
M. Willer
SEC.-TREASURER



R. Hewitt
PRESIDENT

F. S. McCarthy
VICE PRESIDENT

A. P. Dawson
COUNCILLOR



L. P. Baker
COUNCILLOR

# PERMANENT EXECUTIVE OF THE CLASS OF 3T5

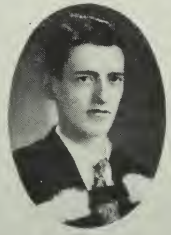
## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

J. I. Brenzel
COUNCILLOR

F. R. Gorrie
COUNCILLOR



R. R. Finlay
COUNCILLOR

# Message of the Permanent Executive, 3T5

The class of 3T5 will soon cease to be an undergraduate body and the members of this class will each wend their own way out into the world.

We came here first, knowing very few members in our year. As the years passed we gradually became more acquainted with our fellow-students, whose real characters have been revealed, the result of which has been the gathering of lasting friendships which will serve to make happier our future lives.

On looking back to your years at this university, you will undoubtedly consider them the best four years of your life. You will want to cherish them. For this purpose you have elected a permanent executive. Their duties are to keep in touch with you and to let others know where you are, and what you are doing. With this in mind we ask you to drop a letter to us now and then and keep us informed of any change of address, marriage, sickness, etc. This is of far more importance than you realize. The support of every member in the year is absolutely essential.

Regarding future activities, it is planned to have a class reunion, which will include all members of 3T5 from near and far, in November, 1939, at the second Triennial School Reunion. Further information about meetings to be held in the fall will be published in the University of Toronto Monthly.

The executive wishes you every possible sucess—success which will stand as a monument to those years of preparation and will reflect credit on the University, the Faculty and the year of 3T5.

*President*
Bob Hewitt
56 Roncesvalles Ave.,
Toronto, Ontario
Lakeside 6274

*Secretary-Treasurer*
Murray Willer
1243 St. Clair Ave. W.,
Toronto, Ontario
Lloydbrook 1979

R. Hewitt
CIVIL REP

H A Marten
SCCP TREAS

S G Farrar
PRESIDENT

Dean C H Mitchell
HON PRESIDENT

M Willer
VICE PRESIDENT

J H Atkinson
M & M REP

R F Gross
ATHLETIC REP

# FOURTH YEAR EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

J. Bowen
DEBATING REP

J F Baenzel
ARCHITECTURAL REP

J Hickey
MECHANICAL REP

G W Mills
CHEMICAL REP

R R Finlay
ELECTRICAL REP.

# 3T5

There have been and will be many classes of S.P.S., but rarely one like 3T5. With splendid co-operation and support from their classmates, each year executive in its turn endeavoured to make their year a success in every way, and one long to be remembered.

So that when we look back over our four years as undergraduates of the class of 3T5, we realize that mentally, physically and financially, we have done exceedingly well. In our first year, we wisely chose Doug Bruce, Bob Hewitt, and Bill Blake to take charge. That we were led safely through that terrible (?) first year is now well known.

Then Don Ritchie, Nels Kelly and Ron Alexander were elected to the driver's seat for our Sophomore year. Continuing our first year practice, seldom has such a successful year been enjoyed by engineers.

The election results for our Third Year placed Nels Kelly, Jack Brown, and Rex Davey in the responsible places as our President, Vice-President, and Secretary-Treasurer. Under their careful guidance, that Junior Year was highly successful from every angle.

For our Senior Year, Gray Farrar, Murray Willer, and Howard Marten were elected to the "worry-worry" class. It was their duty to provide for our permanent executive and still make the graduation ball far and away the best yet.

Now, with the future ahead, and a job to land sooner or later, other things will require our undivided attention and concentration. Good luck, men!

But let us pause to pick out the prominent features of our S.P.S. days. Between our initiation in the second year drafting room to that graduation dinner in the Great Hall, we have fared well. Don't forget we were the last Freshmen Class to be initiated in the old School way, and after that we settled down to make history. 3T5 engineers distinguished themselves in executive positions both in School and in the University at large, while the Clubs have prospered and grown under their capable 3T5 Chairmen.

Athletes from that same class were the mainstay of many championship teams, such as the Mulock Cup winners in Senior Rugby. Seldom has a single year of S.P.S. claimed as large a number of individual stars at track and other meets.

Naturally, we have had our ups and downs, our lucky streaks and bad breaks, but now, with a splendid permanent executive under the capable leadership of Bob Hewitt, *and with the good old 3T5 spirit still there*, we may confidently expect to enjoy a good many well-planned and profitable reunions as Alumni of S.P.S. class 3T5.

S. G. Farrar,
*President.*

## 3T6

3T6 passes in review! Looking back over the year just passed, we find much to be thankful for and little to regret. In spite of the fact that many 3T6 men did not give their whole-hearted support to the executive, those who were considerate enough to do so received full value for their money.

The year's social activities opened with a dance at Coles', College Street, and this festive eve was enjoyed by all and sundry. The music, supplied by one of our own—Nels Kelly—was well suited to tripping a very light fantastic.

When the close of the year was heralded by the annual elections, the Juniors combined with the Frosh in one of the most enjoyable parties of the year. This time the Silver Slipper was the festal hall.

In turning over the reins to the new executive of G. E. Smith, G. O. Loach and C. A. Millar, we feel sure that you will be proud of them. May we urge you to give them your loyal support.

G. A. Aitken,
*President.*

## 3T7

It can be said with no uncertainty that in every way this year has been a decided success.

We started off by welcoming the Frosh in the traditional manner and climaxed this "welcoming" with an initiation which has the reputation of being the best since the scene of this activity was moved to Hart House.

During the whole "tapping" season our class was paid the compliment of having the entire campus police force as our visitors every dinner hour. This alone is sufficient indication of our activity at that time.

It must have been a relief to this organization when the feud between the first and second years was terminated by the Soph-Frosh dance.

Becoming bored with the routine of obtaining a higher education, the beard growing contest was instigated to bring about some excitement. This much publicized contest was terminated at our Christmas dance, which was held at the Parkdale Canoe Club.

Anyone who had a secret craving for apple cider had no need to suppress it at this event. The careful preparations for the dance were climaxed by the programmes being carefully locked in the Engineering Society safe until the next morning.

Time to study for two examinations was supplied by the much-needed Christmas holidays.

When the examinations were finished everyone except those who expected letters started into the hectic last lap by breaking New Year's resolutions.

New interest was added to the class activities by the introduction of inter-department hockey games. The chief features of these games were the diversity in colour of the sweaters worn by the players and the decided lack of rules.

The series, however, wound up with the Mechanicals declaring themselves champions and thereby achieving a position in a very dusty corner of 3T7's hall of fame.

The coming elections and the nearness of the examinations gave sufficient excuse for holding another year party at the Parkdale Canoe Club on February 26th.

After this event the bank balance of the class was $146.00.

In both Intercollegiate and Interfaculty sport 3T7 has been ably represented. Without singling out any few men it is sufficient to say that Second Year men were largely responsible for the Junior lacrosse championship, the soccer championship and the Interfaculty track championship coming to School.

The retiring Executive expresses gratitude for the whole-hearted support they have received from the class as a whole in every activity during the year. We hope this fine School spirit will continue and that the new Executive under Vern Leworthy will receive the same support.

H. N. Potter,
*President.*

## 3T8

On September 24th, approximately two hundred and twenty so-called "freshmen" and "repeaters" arrived at the University. Few of us knew each other and still fewer of us knew or realized what lay ahead of us. After registration we all felt somewhat poorer and had visions of activities of all kinds comforting us, the uppermost in our minds being initiations, dances, athletics, and least of all work. The following morning we assembled in S 38 (ye old drafting room), awaiting the Dean's address. In the Dean's address, as well as those given by Don Ritchie and Bob McIntyre, we were impressed with the friendly spirit that existed about S.P.S. and the need of hard work. In the same friendly manner, Nev Potter, representing the Sophomores, welcomed us, put us in our places and impressed us that we must wear green ties and suffer various tortures at the hand of Second Year. After a short physics test, in which most of us disgraced ourselves due to a summer lacking in study, and a trip through Hart House, we completed our first day at S.P.S.

For the next few weeks we fought to preserve our handsome green ties; were introduced to the ancient practice of tapping, etc.; bought stacks of books and instruments and began to work (a little). Second Year still continued to impress or rather impress themselves

upon us, till finally they entertained at the reception at Hart House on October 19th, 1935. After this form of initiation and supper in the Great Hall, we, the class of 3T8 felt that we were now "Schoolmen".

Ad interim we had elected our executive and prepared for the next high light, the "Soph-Frosh" at the Royal York on Tuesday, November 6th, 1935. I think that almost all of the 430 couples that attended our first University dance agreed that it was most successful. In spite of our work, and outside activities, most of us found time to attend "School Dinner" and the Club "Smoker" until the long-awaited Christmas holidays arrived.

For a few days after the holidays, we were busy with examinations and after them came our first class party at the Parkdale Canoe Club on January 15th. For the next week we turned our thoughts to the pursuit of elusive knowledge with interruptions for School Nite and Club dances. Finally, on February 28th, the night before elections, we held our third and final dance at the Silver Slipper.

Throughout the year the class of 3T8 has been well represented in both Interfaculty and Intercollegiate athletic activities. Without singling out anyone for special mention we can say that all of us who represented S.P.S. and the University were a credit to "School" in general and 3T8 in particular.

And now with elections over and the thought of exams close at hand, we are turning all our attention to our work. Here's hoping that we can all manage to pass our examinations and get back together again for a bigger and better year during 1935-36. In closing, this year's executive wish to thank all members of 3T8 for the help they have been to us and at the same time wish to welcome the incoming executive. Let's all get behind them for perhaps the most important year, our Sophomore year.

Best o' luck, lads!

A. H. Kingsmill,
*President.*

# School Dinner

It would be more than difficult,—nay impossible, I say, to visualize a year at School without the tradition of School dinner. In recording another such event on the pages of history it is equally difficult to find words to express the dazzling grandeur, the traditional formality and the startling originality that went to make up the 45th Annual School Dinner.

Early in the fall a hard-working committee was gathered together and for weeks thereafter they racked their scheming brains to produce a function that would live down in the annals of time. Tuesday, November 20th, saw the culmination of their efforts when some six hundred loyal Schoolmen invaded the stately walls of Hart House to do honour to the gala occasion.

Who could view the elaborate decorations in the Great Hall, the parade of the forty beers, without feeling a surge of the old School pride within him? Who could ever forget the arrival of the turkey on a miniature steel truss; the gay procession of smiling waitresses, bedecked in School colours, and the rollicking antics of the clown band, deafening the assembled multitude with their raucous music—not one I say—least of all a Schoolman!

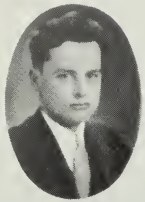
An unusual programme, resplendent in its yellow, blue and white, outlined to the guests the order of the evening. Following a toast to the King, Schoolmen were allowed to demonstrate the strength and quality of their respective vocal chords in a lively sing-song led by Ross Workman. During this rather questionable entertainment two professional tumblers made their appearance and for the next few minutes travel in the aisles was made more than precarious by their daring antics. Such were the preliminaries to that night of nights!

The President of the Society, Mr. D. G. Ritchie, acted as chairman of the event and fulfilled his duties admirably well. A toast to the University was proposed and this was replied to by Canon Cody, the President, in his inimitable manner. Dean Mitchell answered a similar call to the Faculty, excelling all previous exhibitions with his practical demonstration of the culture obtained from four years at School. The distinguished guests, representing a wide variety of vocations, were then introduced and given an opportunity of saying a few words to the attentive audience.

One of the outstanding events of the evening was the presentation of scholarships to those hard-working Schoolmen who had won recognition at the annual examinations. Each man was introduced by the chairman to the President of the University, who presented them with embossed diplomas as a fitting tribute to their academic ability.

In the speech of the evening the Hon. Vincent Massey held six hundred Schoolmen spellbound by his ready flow of rhetoric and his indisputable logic. His words of wisdom were poured on eager ears and will long be remembered by all those present.

A.J.E. Smith



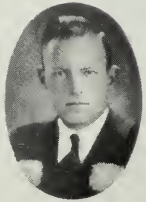
W.M. Lawrason

J.A.C. Bowen

D.G. Ritchie

W.G. Armstrong

C.C. Hoag



H.H. Black

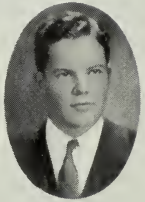
DECORATIONS

# SCHOOL DINNER COMMITTEE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935



W.A. Salter

PROGRAMME

F.S. McCarthy

ADVERTISING

R. Hewitt

MARSHALLING

J.H. Lechenby

RECEPTION

A.C. King

ACCOMODATION

A rousing "Toike Oike" and a few remarks from the chairman brought the event to a close. Thus has the 45th Annual School Dinner become nothing but a pleasant memory! To those who are leaving School this year it will always be the outstanding function of their college days, and to those who follow, it will be an additional incentive to maintain the record of previous years.

"Ball of Fire".

## Graduation Ball

For almost four long years this party had been looked forward to eagerly, and when the time for it finally did come,—what a party!

Almost 180 couples enjoyed the captivating music played by Brian Farnon's orchestra and despite the large number attending, it was a small party; because it was our last class party as undergraduates, and the usual 3T5 spirit of friendship ran true to form.

Beautiful girls, soft lights and seductive music combined to make our final formal party an outstanding success. The Crystal ballroom of the King Edward Hotel was the place, and March the 8th is the date to be remembered. A few may recall that it was a Friday night. Anyway, the committee managed to arrange the floor show and supper for that night, and as comments were favourable on those two parts of the programme, everything seems to have coincided.

The party was held in cabaret style with lofty balloons, bright spotlights and flowers, and that dazzling Crystal to complete the setting. Only one of the special attractions of the evening was the prize dance, when the two lucky couples destined for Reno found themselves the winners. Mrs. Mitchell very graciously presented the prizes.

Supper might better be called dinner since for that occasion the maitre d'hotel provided a quantity and variety of delectable viands to surpass anything before it.

The Miners added that finishing touch to a successful party by brushing aside all thesis worries, and seeking their riches in a different field. A farewell yet cheerful message by the Dean reached us from the head table during supper and we realized that our S.P.S. days would soon be over.

Representatives from McGill, Queen's, O.A.C., Meds., Trinity, Victoria, McMaster, Pharmacy, and Osgoode were present to represent their colleges at the outstanding formal party of the S.P.S. year. The wives of Faculty members who graciously lent their patronage to further enhance the evening included Mrs. Mitchell, Mrs. Haultain, Mrs. Angus, Mrs. Guess, Mrs. Bain and Mrs. Young. 3T5 is grateful to them, and express the wish that they enjoyed the party as much as their hosts did.

D. G. Ritchie
President

W. G. Armstrong
Vice-President

R. Hewitt
Chairman

J. R. M[illegible]
F[illegible]

M. A. Cooper
Accommodation

# SCHOOL NITE COMMITTEE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

J. F. Reid
Reception

H. L. McQuire
"The Revue"

F. S. McCarthy
Music

# School Night

The Engineers' annual invasion into the field of entertainment made Tuesday, January 22nd, 1935, a memorable date. Determined to eliminate crowding, School included more rooms than ever for dancing and pressed the Hart House Theatre into service—giving full sway to the superlative dramatic talents of the performers.

The smooth music supplied by five popular orchestras was highly appreciated after the hilarious excitement enjoyed during the "Revue". The aquatic events in the old swimmin' 'ole attracted many guests and the performers did their utmost to satisfy everyone by furnishing an exciting polo game and breath-taking dives.

Four supper periods eliminated the usual restless waiting for food, and contentment reigned, more supreme than ever, after a tasty sandwich supper had been served. The motto "quality and not quantity" was observed—under protest of the hardy Miners but approval of the wiser fair sex.

The genial patronage of Mrs. H. J. Cody, Mrs. J. W. Bain, Mrs. H. H. Madill, Mrs. W. J. T. Wright and Mrs. R. Taylor, enhanced the occasion and made a very enjoyable evening for the committee.

The House, after experiencing a brief spell of the pleasant company of Schoolmen's alluring lady friends, unwillingly slumped back to the regular conventional routine of masculine possession, wondering why such an event could not occur more frequently. Thus, contrary to the fears of the advocates of superstition, the thirteenth annual School Nite was registered a success in the pages of the ages.

R. Hewitt,
*Chairman.*

# School Formal

Once again School has led the way to saner organization of student activities, and once again has her decision been acclaimed a success! This year Schoolmen, with their inborn economic instincts, decided to put their formal party—the School At-Home—on a self-sustaining basis and the result was—the "School Formal".

Friday, February 15th, saw that well-known rendezvous—the banquet hall at the Royal York—transformed to a place of rhythm and beauty, while some two hundred and thirty loyal Schoolmen and their lovely ladies swayed to the melodies of Geoffrey Waddington and his orchestra. Prestige was lent the occasion by the presence of the patronesses, Mrs. C. H. Mitchell, Mrs. R. R. McLaughlin, Mrs. C. F. Morrison and Mrs. M. J. C. Lazier.

At 2 a.m. the sweet music faded away and after a lusty Toike Oike the weary Schoolmen wended their way homeward.

This party will long be remembered as the first "School Formal" —the first formal School dance to be operated at a profit.

J. L. Jowsey.

C G Levy
ACCOMMODATIONS

W G Armstrong
CHAIRMAN

D G Ritchie
PRESIDENT

F S Mc Carthy
MUSIC

# SCHOOL FORMAL COMMITTEE

## Faculty of Applied Science and Engineering

J L Jowsey
TICKET SALE

W E Ewens
ENTERTAINMENT

UNIVERSITY of TORONTO

1934 1935

F A Fleming
SPORTOIKE

F S Mc Carthy
DIRECTOR OF PUBLICATIONS AND PUBLICITY

M P Johnston
EDITOR

W E Barnett
ASSISTANT EDITOR

W F McLean
1ST YEAR EDITOR

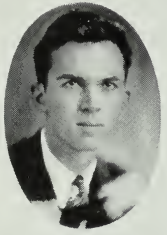
# TOIKE OIKE STAFF

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

F A Leggett
2ND YEAR EDITOR



J B Bryce
4TH YEAR EDITOR

J W Kerr
3RD YEAR EDITOR

# Toike Oike

For many years Toike Oike has been published "every now and then" by the Engineering Society of the University of Toronto. This "every now and then" usually coincides with such events as the initiation (or rather the reception) for Freshmen, School Nite, and in the past, School At-home.

This year, after some hesitation it was decided to print the School Nite edition in three colours. Though the golden borders may have caused some of the revellers an uneasy feeling in the equatorial zone, the appearance of the final copy in three colours more than justified Frank McCarthy's idea for a Toike Oike in School colours.

Other issues were the Freshman Edition, Christmas Edition, Election Edition, and, of course, the Graduation Edition.

Sportoike is now a regular feature of Toike Oike and much credit is due to Fred Fleming for his breezy write-ups which have kept Schoolmen informed of School's activities in the field of sport.

The new column entitled "A Lily to You", later changed, due to fluctuation in florists' prices, to "An Orchid to You", drew attention to some of the hard-working gentlemen who make possible our Engineering Society.

It does seem unfortunate that more Schoolmen do not become contributors to this paper. If you have had some funny experiences in the shop this summer, or if you have just heard some particularly funny joke (Christian, please!), instead of asking "When's the next Toike Oike coming out?" write down your amusing incident or joke and hand it in at the Engineering Society Office. You will find a new interest in the next Toike Oike and at the same time you will lessen the work of the Toike Oike Staff.

M. P. Johnson,
*Editor.*

# Gull Lake

Hear ye, hear ye, and hearken to the voice of experience as it imparteth knowledge to those who have yet to witness the alarm bell, so early in the morning, as it called us from our warm, warm cots. Gull Lake has uncovered charms and mysteries, impossible to record here, but which may be known only through experience.

For the 15th consecutive year Gull Lake and the surrounding country for miles around once more took on a new life of excitement which resulted in reports of several "nervous breakdowns" in the district. The reason for this sudden chaos was the arrival of twenty Miners and twenty Civils at the University Survey Camp which is located (unfortunately for the folks of Minden) just three miles from town.

For the first few days the students acted as they usually do when trying to keep the professors busy, but it was soon seen that they themselves were enjoying the holiday. As perfectly normal Schoolmen we soon discarded clothes—setting the styles for full-dress in that particular area—for shorts and running shoes. After a friendly meeting and a settlement of all preliminary arrangements it was decided to start work where the other fourteen years left off. Not having a good enough check, the professors had carefully laid plans as to what each party should do. Hills were elevated, lines run crooked, but by some mysterious means the finishing point was always reached. To the Civils go the honour of obtaining the correct time from the sun. (After plenty of practice.) The Miners, on the other hand, busied themselves with sinking a shaft and looking for rocks that were conspicuous by their absence.

Work stopped at 4.30 in the afternoon and after reading the precious letter, plans were made for the evening's entertainment. This depended on two variables, first the fellow and second the weather. At first everyone was able to take part in the evening's activities, but later on those students that were required to write "supps" were handicapped. Rugby was the standout and who will ever forget that particular night when the bunkhouse was turned into the gridiron? Scarred shins, battered noses and sore muscles were the only points scored! The baseball fans were able to root and cheer when we defeated the Government Camp No. 2 in a close game. Some of the boys whooped it up at playing badminton and further particulars can be obtained in this regard from Harold Atkinson, who is reputed champion. Those having canoes had little time on their hands, but spent the evenings gliding over the moonlit waters. How lovely!

Two dances were held—enabling us to meet a number of people who had not as yet been visited by members of the camp. The dormitory, our only excuse for a dance hall, looked like a natural forest. Our ample supply of (homemade) chesterfields, resplendent in their gawdy blankets, gave us a decided edge over the rustic reality.

# survey camp

# GULL LAKE

Unfortunately there was no musical talent in the camp, so we danced to the rhythmic strains of the "Four Aces". Our thanks and appreciation were extended to Mrs. Minto, who supplied the necessities at intermission. After the dance McFarland and Ewens were forced to become real bushmen if they wished to go to bed, as the evergreen decorations seemed to take root in the vicinity of their beds. Speaking of dances, Carnarvan will long be remembered by those who attended and I don't think Bob Neelands will forget those at Minden in a hurry!

Regatta day, as usual, was a howling success. Everyone at camp entered with the honours for the day going to Pat Morgan and Bob Junker. As we held our dance previously, the evening of this eventful day must needs be spent in an eventful manner. So-ooooh it was decided that we should find new homes for certain beds, occupied as a rule by certain fellows who did *not* spend a certain week-end in a certain Survey Camp.

Now at every Camp there are certain highlights and many mysteries that will long remain in the minds of those present. 3T6 is no exception to the rule. Our great mystery is our new prodige, Vic Zachanko, and at this time we wonder if he has mastered that never-to-be-forgotten melody, "In the Valley of the Moon", as yet. Many have asked if Fred Sweet and those other young gentlemen enjoyed their walk home after a delightful ride to Haliburton. Rumour has it that their axle broke about four miles from town. Two questions that are still under debate are: 1. Where all the apple pies from Mrs. Minto's kitchen disappeared to; and 2. How eight fellows could possibly enjoy a corn-roast when it was raining so hard.

All in all then, gentlemen, it can well be said that 3T6 had one of the best summers ever at Gull Lake. The days, the many happenings—both foolish and serious—will, I am sure, live long in the memories of all who were at the Camp last year. Our advice to 3T7 and other years to follow is: "Take advantage of your summer to form new friends, for we all should remember that 'He who has a million friends, has not a one to spare'."

"The Scamp".

D.B. Bruce
SEC. - TREAS.

D.G. Ritchie
PRESIDENT ENG. SOCIETY

R.A. Webber
PRESIDENT

Prof. W.M. Treadgold
HON. - PRESIDENT

J.A. Upper
VICE - PRES.

N.F. Gross
4TH YEAR REP.

# ATHLETIC ASSOCIATION EXECUTIVE

## Faculty of Applied Science and Engineering

UNIVERSITY of TORONTO

1934 1935

R.A. Boyle
3RD. YEAR REP.

C.W. Eggert
2ND. YEAR REP.

J.D. Fox
1ST. YEAR REP.

# The School Athletic Association

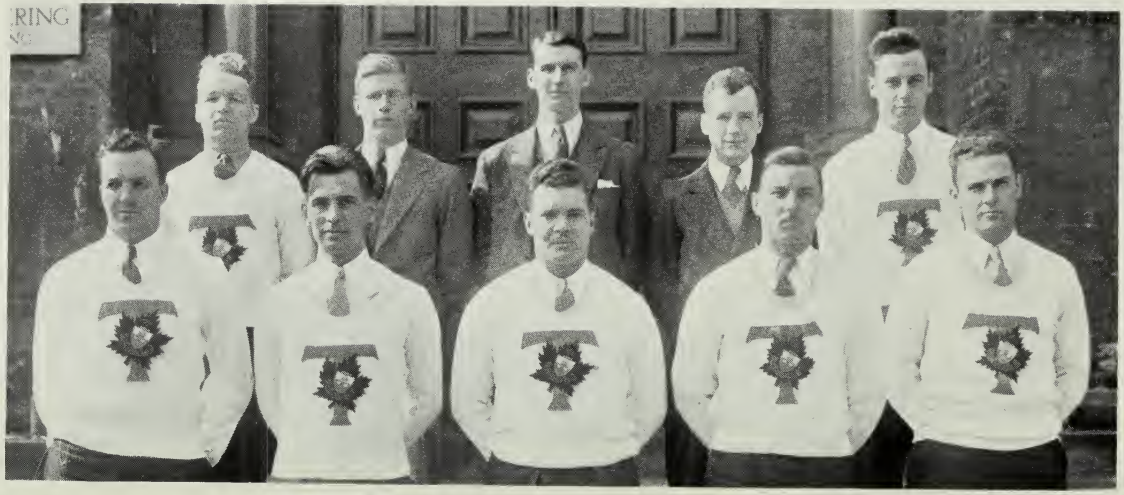
The School Athletic Association was formed around the year 1902. Previous to this time each individual sport had its own Club and Executive and there was no union at all between the Clubs. The University Athletic Association was formed and shortly afterwards School started their Association, which was the governing body for sports carrying its name.

The purpose of the School Athletic Association to-day is to support Interfaculty sports; to try and get as many Schoolmen as possible in a sport of some kind; and to aid the University of Toronto Athletic Association in any way possible.

The Association consists of honorary members, the executive elected yearly from the undergraduate body at School Election, and the student body, consisting of all Schoolmen. This body supports all sports that the Interfaculty Union provides and in most cases is represented by both a junior and senior team. They are:—rugby, B. W. & F., track, hockey, swimming, water polo, lacrosse, gym, volleyball, basketball, baseball and rifle team.

Up to the date of this article, School has annexed the following titles—outdoor track, soccer, lacrosse, rifle and Junior assault. School also got first place in the Interfaculty harrier, and second place in the Junior swimming meet.

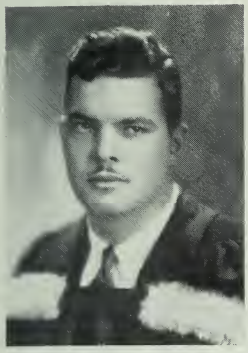
R. A. Webber,
*President.*



S.P.S. "T" HOLDERS

*Back Row* (Left to Right): R. Miller, P. MacDonald, C. Annis, J. Millison, R. Davey.
*Front Row:* R. Eaton, J. Bowen, R. Webber, P. Hooper, R. Westheuser.

# The Bronze "S"



Once again the Bronze "S" has been conferred upon a Schoolman, as a symbol of recognition by his fellow men, of this gentleman's outstanding athletic ability and good fellowship. A most worthy recipient for this signal honour has been found in Robert A. Webber, an athlete and a gentleman having every right to take his place beside those fine men who have been similarly recognized in previous years.

During his college career, Bob has built up a record in athletics that may be envied by many and achieved by few. "Stormy" Webber is probably best known for his fine deeds on the football field, where his indomitable spirit has gained for him the respect and support of every admirer of good sportsmanship. During his stay at School, he has been a member of no less than six football teams, holding down regular positions on the Junior Intercollegiate Champions of 1930, the senior O.R.F.U. squad of 1931, and the Intermediate Intercollegiate team of 1932. In 1933, he was an active member of two teams, firstly, Balmy Beach of the O.R.F.U., and then the Champion Senior School team. As for the past season, everyone will remember Bob as the plunging halfback of the Senior Intercollegiate team.

Swimming and water polo are two other sports to which Mr. Webber is ideally adapted. For three years he has been a member of a School water polo team, and each year that team has reached the finals. In 1930 and 1932, Bob held down a position on the School swimming team, the 1932 squad annexing the Fitzgerald trophy.

Not content with such deeds as these, he turned his attention to lacrosse, and for four successive years served School in this respect.

During the past year he has occupied the worthy offices of President of the Athletic Association, and a member of the University Athletic Directorate, and showed his financial ability by guiding the Association through a most successful term.

On looking over such achievements, one cannot help but realize that there could have been none other quite so worthy of possessing the Bronze "S", and so I say:

"Hats off, gentlemen, to Bob Webber".


S.P.S. "S" HOLDERS

*Back Row* (Left to Right): D. Thomas, C. Annis, F. Adams, J. Powlesland, H. Wilkinson, D. Bruce, R. Westheuser.
*Sixth Row:* D. Sommerville, J. Bowen, W. Atkinson, A. Brackey, F. Tooke, R. Davey, B. Paterson, J. Lilley, R. Boyle, S. Brigham, G. R. Bruce, C. Burnett, C. B. Hewitt.
*Fifth Row:* J. Millison, R. Stroud, G. Walkey, G. Black, M. Sherwood.
*Fourth Row:* L. Baker ,P. MacDonald, A. U. Houle, D. G. Ritchie, W. Fraser, A. C. King.
*Third Row:* H. McNicol. G. Beard, R. Davidson, B. Woods, C. E. Eggert, R. Miller, R. Rule.
*Second Row:* H. Minaker, R. Webber, R. Y. Eaton, E. Kearney, E. Wolfe, W. Freeland.
*Front Row:* H. Self, R. Gross, L. B. Reider, G. Murray, C. Hogg, J. Froster, R. Bates.

# School in Intercollegiate Sport

The Engineers from the Red School House have again this year played a very prominent part in Intercollegiate sports and in doing so have maintained the name of School high on the campus.

Although the Senior Rugby team did not win the title this year, it was a closely contested schedule with Queen's and it was not through the lack of trying that the cup did not again rest at Varsity. On this team we were well represented by such men as "Butch" Ronny Allison, who played his usual excellent game at outside wing, Art Upper and Bob Webber who performed in the backfield. Upper teamed up with Bobby Coulter to make one of the best set of running halfs in Senior Intercollegiate ranks this year. Ted Perry, the big man from mining, played inside wing and did a bang-up job of it. On the second team, "Whitey" Miller and George Powell played stellar games and were frequently brought up to bolster the senior ranks. Don Thomas was lined up with the second team also. The Junior team claimed such men as "Smiler" Miller, Bill Holt and Al. Jacob.

This year, Phil Jefferies was our sole representative on the Senior Hockey team. However, he added lots of punch in the attacking division.

The Senior Track team had a goodly representation from School in athletes such as Ashenhurst, Hogg, Westheuser, Eaton, Hickey and Rodzig. On the Intermediate team we have "School Boy" Hawker, a 440 man.

J. Millson and Freddy Smith, boxers; A. Houle, a wrestler, were the men from Engineering to make places on the Senior B. W. & F. team, while Minaker and Pidduck made places on the Intermediate team.

The Swimming team, which won the championship this year, was bolstered by such men as Hooper, Eggert, Jennings, and Otter. The manager of the team was none other than Doug. Bruce. Hooper also played senior waterpolo; Charters played a good game with the junior waterpoloists.

The champion English Rugger team was captained this year by Cliff Crawford. Nice going, "Joe".

The Varsity eight, which again defeated McGill, had R. Eaton, P. MacDonald and A. King pulling a strong oar.

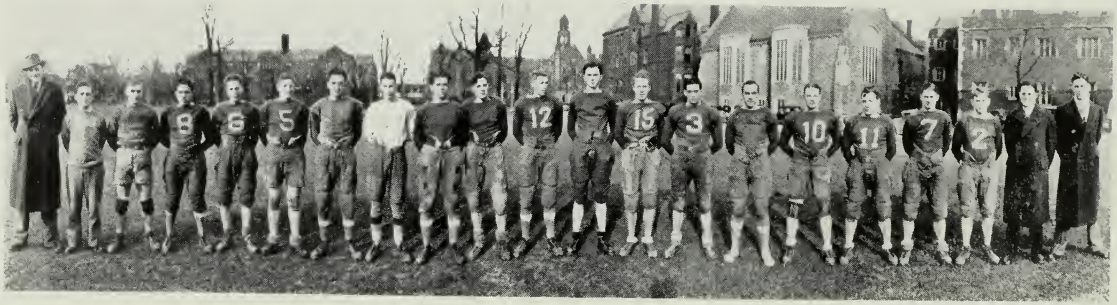
The Varsity gym. team again vanquished McGill, and in doing so ranked their five men ahead of McGill's five. On this team School was ably represented by G. Beard and A. Lewis.

J. Bowen and R. Davy again earned places on the soccer team.

University sports were well represented in nearly every division this year by the Engineers, and we can be justly proud of such athletes. Most of these men also take part in some branch of Interfaculty sports and so do their bit both for the University and Faculty.

Good work, Schoolmen—keep it up.

R. A. Webber.



S.P.S. SENIOR RUGBY TEAM

*From Left to Right:* C. J. R. Ballantyne (Manager), J. M. Troster, W. R. Smith, I. M. Saunders, W. E. Ledingham, J. N. Lilley, R. C. A. Pittis, H. S. Dando, H. W. Royl, B. J. F. Hamilton, J. L. Gartshore, J. B. Bryce, J. A. McArthur, M. L. Sherwood, P. W. Gooch, K. H. J. Clarke, L. P. Baker, B. S. Wood, L. S. Lotimer, R. F. Gross, S. K. Brigham.

## Senior School Rugby

It has been truly said that "every action must have its reaction", and this year that ancient adage might very well be applied to Senior School Rugby. After last year's fighting School team battered its way to a Senior title, a definite reaction set in and culminated in this year's squad winning only one game of a four-game series.

The same fighting spirit, the same determination to do or die, the same wide open play that humbled the "scarlet and gold" but a short year since, were still in evidence—but the team just could *not* get going. Each game was close and well fought and victory seemed within easy reach—but each time fickle fortune seemed to snatch it away.

Due to the unfortunate absence of Vic Ballantyne, the elected manager, and a few complications in the selection of a coach, the School team was sadly handicapped early in the season. Many thanks are, however, due to "Scotty" MacMillan, who took charge in mid-season and coached the boys through the remaining games.

Every reaction must have its end and we hope for an early termination of this one in particular. Next year we look for a return to the old form and expect to see the Mulock Cup once more entrusted (for safekeeping) to the Engineers.

"Ball of Fire".

## School B. W. & F. Team

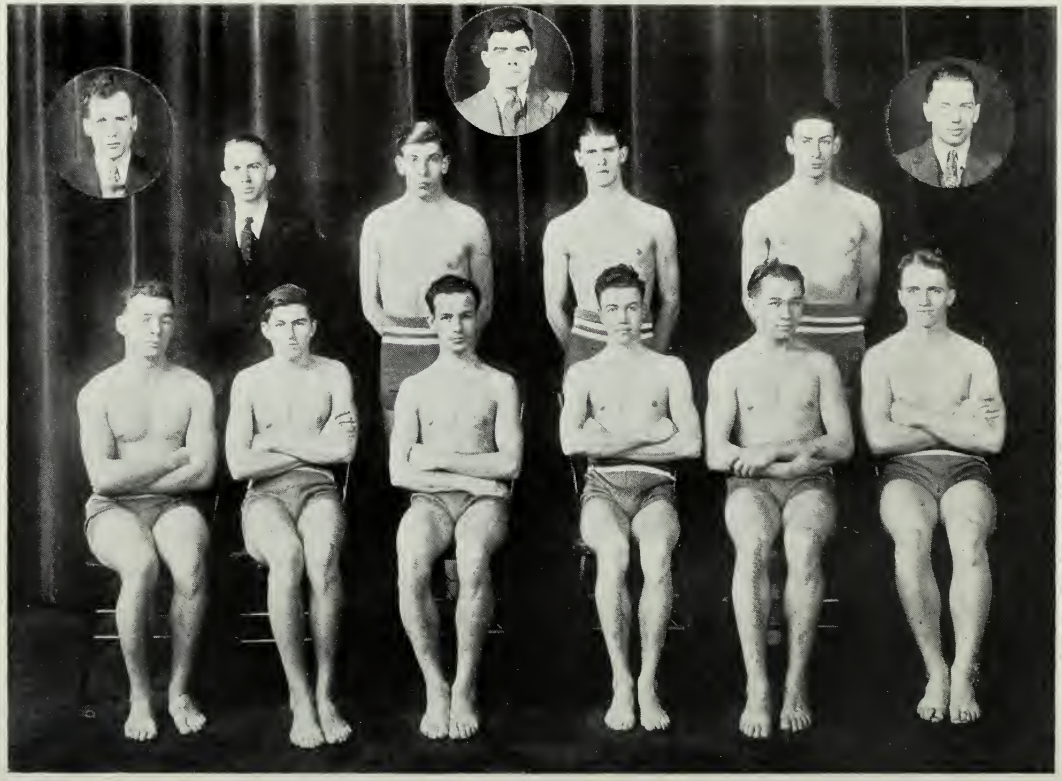
As usual, an ambitious group of mitt, matt, and foil men from School greeted Coaches Martin, Black and Barton as soon as the fall rolled around last year. The ranks of last year's powerful team were somewhat depleted by the graduation of a number of mighty Miners, who made up about one-half of the team. However, our coaches succeeded in moulding a worthy squad from the less experienced new men.

The first chance for our men to show their form was the School Assault, held early in December. The winners of this stirring meet were:

*Boxing*—Carmichael, Millson, Graham, King, Bracken.

*Wrestling*—Barber, Minaker, Houle, Ostrowski, and a draw between Zachanko and Lathrop. Fensom won the fencing title.

The Junior Interfaculty Assault followed shortly afterwards in December. School was fortunate enough to win this meet, closely followed by Meds. Our men who carried off the honours were: Pidduck and Millson in the boxing and Houle in the wrestling. Boyd, Minaker and Zachanko were in the finals while Fensom was third in the fencing.



S.P.S. B.W. & F. TEAM

*Back Row:* Wolfe (Manager), Graebe, Graham, Bracken.
*Front Row:* Jamieson, Butschi, Barber, Carmichael, Rodzig, Snitch.
*Inserts:* Millson, Houle, Ostrowski.
*Absent:* F. Smith, Boyd, Pidduck, Minaker, Zachanko, McPherson.

In January the boys got down to real serious training and F. Smith and Pidduck helped the U. of T.'s cause by providing two of their three wins in the boxing meet with Syracuse.

The Senior Interfaculty Assault came up at the end of January, but unfortunately some of the men had been working a little too vigorously and our team had to struggle along without Boyd, Ostrowski, Lathrop and Barber, who were all out with injuries. Pidduck, Smith and Minaker were victors, and Houle a finalist. However, School came third, right behind Meds. and O.A.C.

When the intercollegiate boxers and wrestlers went to Cornell and Rochester for special meets, S.P.S. provided winners in Smith and Millson, while Houle drew in his bout.

Although Varsity met a sad fate this year in the Intercollegiate Assault at Queen's, Millson of School was one of the three Varsity winners. Minaker and Pidduck represented S.P.S. on the Intermediate Intercollegiate squad at London.

Considering the limited experience of our men, it might well be said that they turned in a very creditable series of performances and I can conscientiously say that the future of the B. W. & F. team for the next two years appears very bright—so, may I take this opportunity of wishing next year's team every success in their quest for the Senior Assault "Mug", which rightfully should repose in the hallowed precincts of good old School.

E. H. Wolfe,
*Manager.*

## Junior School Rugby

This year the members of the Junior squad more than earned the respect of the other teams in their group in Mulock Cup competition. They didn't win the coveted mug, but gave their opponents—Junior Meds., Trinity, and Forestry—plenty of keen competition. The Junior Schoolmen proved that "they could hand it out as well as receive it". Unfortunately. they had "reverse English" on the ball and starred in the catching position, with the result that serious injuries early in the season marred their chances of victory.

The team was very ably handled by "Hank" Martin, former Argo flying wing, and his untiring efforts to build up a worthy aggregation were greatly appreciated by every member of the team.

A fact worthy of note was the large number of Frosh that turned out to lend their support. Since most of these men will be back next fall, Junior School will have a real fighting squad who should go a long way towards winning the cup.

Ross Clark,
*Manager.*

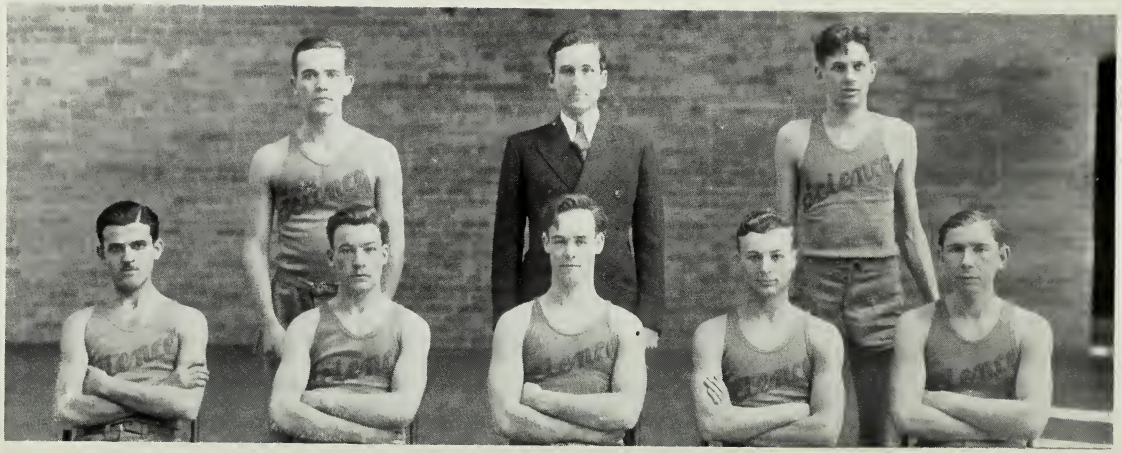
S.P.S. JUNIOR RUGBY TEAM

S.P.S. OUTDOOR TRACK TEAM
INTERFACULTY WINNERS—1934-35

*Back Row* (Left to Right): C. E. Lewis, H. B. Ashenhurst, Prof. E. A. Allcut (Hon. President), G. R. Bruce, F. A. Fleming.

*Front Row:* J. A. McArthur (Manager), J. J. Hickey, J. Rodzik, P. H. Hawker, R. G. Westheuser, W. M. Hogg.

*Absent:* Gandier, Eaton, Smith, Pidduck, Powell.



S.P.S. JUNIOR BASKETBALL TEAM

*Back Row* (Left to Right): J. K. Ronson, H. J. Wilkinson (Manager), T. H. Mitchell.
*Front Row:* H. J. Hershoran, S. Murray, F. L. Johnson, J. Kuly, D. Sharpe.

# Outdoor Track Team

Following the usual custom, S.P.S. again won the Interfaculty Track championship, demonstrating the supremacy of the Engineers on the cinder track. University College, which placed second in the final standing, although beaten by eleven points, ran us a real race, and provided one of the greatest thrills of the day when its relay team beat ours in the final hundred yards, after we had led by a large margin all the way.

The team, as a whole, performed nobly, and several fellows made exceptionally brilliant efforts. Among these were: Ronny Westheuser, who chalked up a double victory by winning both the discus and the shot, creating a new record in the former (a habit with him); Bert Ashenhurst, who obtained second place in both the sprints; Hickey, who came through with a first and third in the high and low hurdles, respectively; Bill Hogg, who made the rest of the field look silly in the three-mile; and Russ Eaton, the Intercollegiate rower, who placed second in both the discus and the javelin.

In both the Senior and Intermediate Intercollegiate meets, School added to her prestige. In the Senior, Westheuser and Hogg scored victories in the discus and three-mile, respectively, and, in the Intermediate, "Phil" Hawker won the quarter mile.

There was a large turnout this year, and the boys trained quite faithfully. Many of this year's stars, however, are due to graduate, and, in order to retain the Rowell Memorial Cup, much new material will be needed next fall.

J. A. McArthur,
*Manager.*

# Junior School Basketball

This year the calibre of the players was excellent but their playing showed a lack of sufficient practice. Practically all of last year's team had graduated into the senior ranks and it took a little time for the new players to become accustomed to each other. Nevertheless, the team worked hard, and did not do at all badly in the series.

The team was in a group with Pharmacy and with Senior Meds. School did not have a great deal of trouble in taking the two games from the Medicals but with Pharmacy the opposition was somewhat stiffer. The first game with Pharmacy was very close all through and it was a toss-up who would be in the lead at the end of the game. The Druggists were lucky in the toss and took the game by one basket. The final game with Pharmacy was hard fought, School was doing well throughout but the opposing team were a little more accurate on the shots.

The series, though not a victorious one for Junior School, was close and no one can say that each player did not do his utmost.


S.P.S. SENIOR BASKETBALL TEAM (SIFTON TEAM DEFENDERS)

*Back Row:* R. G. Westhauser, F. M. O'Flynn, J. A. McArthur, S. Brighan.
*Front Row:* Rod. Miller, J. F. Reid, W. J. Cook (Manager), L. S. Lotimer, B. S. Wood.
*Absent:* J. N. Lilley, H. J. Wilkinson.

## Indoor Track

Demonstrating conclusively that the success of the outdoor track team last fall was no "flash in the pan", the indoor team, having practically the same personnel as the outdoor team, retained the Toronto Cricket Club cup by piling up the impressive total of 54 points to 29 for University College, which obtained second place in the meet.

A large proportion of the team's success was due to Bert Ashenhurst, our flashing sophomore, who, in addition to being a member of the victorious mile relay team, scored victories in all the sprints—a notable performance, indeed, and auguring well for his future in track.

The enthusiasm shown in track, both outdoor and indoor, was greater than usual this year. If those who are interested in this form of sport turn out next year as they did this, there is no reason why School should not retain the cup for the third time in succession.

J. A. McArthur,
*Manager.*

## Senior School Basketball

The only claim to glory that can be put forward by this year's senior squad is that they were defenders of the Sifton Cup. The men were individually of high calibre but, due to the lack of a coach, were unable to co-ordinate sufficiently to produce a smooth ball-handling aggregation.

The team, built around Jack Reid, formerly of the Windsor Alumnae, and with one year's Senior Intercollegiate experience, eked out a 17-16 win over Sr. Vic. In the return engagement Sr. Vic took the upper hand in a 20-7 score.

The next game with O.V.C. was featured by the shooting of Ron Westheuser. Needless to say we were on the long end of a 29-10 count. The final game with O.V.C. was indeed a heart-breaker. After leading all the way we went down to defeat, and passed into oblivion as far as this year's series was concerned, when O.V.C. hooped the winning basket with less than a minute to go, to win a 24-22 victory.

In conclusion I would like to thank the players for their wholehearted support. It speaks well for S.P.S. when men will forsake important labs and do extra work to uphold their Faculty in sport.

W. J. Cook,
*Manager.*

S.P.S. JUNIOR WATER POLO TEAM

*Back Row:* Alden, Otter, Schmitt, Hogg.
*Front Row:* Coy, Partridge, Hooper (Coach), Hoag (Manager), Reider, Young.

# Junior School Water Polo

At the first official practice the manager was greeted by the awe-inspiring crowd of three players, all clamouring for positions on the Junior School team—and not one of this multitude had ever played water polo before. By Christmas the number of aspirants had increased to five and the possibilities of an unequalled string of defeats had the Junior School mentors turning back the athletic files and gloomily wondering just how many records the team was going to smash.

With but one week before the schedule opened, fourteen Schoolmen suddenly decided to swim or drown for School.

A team (?) entirely lacking in team play managed to eke out two ties to start the schedule. By this time Eggert, Otter, Hogg, and Reider were rapidly developing into the fastest attacking divisions in their group, Schmitt and Young had begun to form a likely-looking defence, and Partridge in goal was losing that uncertainty which marked his first efforts.

In the next game, with Alden playing his first game as a regular, the team flashed to a decided victory over Junior Meds.

Playing a fast brand of waterpolo, Junior School, under the able coaching of Hooper, finally won their group in spite of disputed games and group playoffs.

With Miller and Coy sharing the relief role, a woefully inexperienced but battling School team was trounced by Victoria in the Inter-faculty finals.

After learning that this year's team was composed almost entirely of freshmen, Lloyds would probably refuse to issue a policy against a School championship next year.

C. C. Hoag,
*Manager.*

# Senior School Water Polo

This year the Senior School water polo team received a setback at the first of the season by the loss of two star players, Russ Eaton through sickness and Bob Webber through an arm injury.

After chalking up one victory over U.C. and playing two tie games with Meds., the team lost a close decision to U.C. by the score of 1-0 in a postponed game. It was unfortunate in this game that Lilley and Boyle were on the sick list and that the team was not quite up to par. However, enough for alibis.

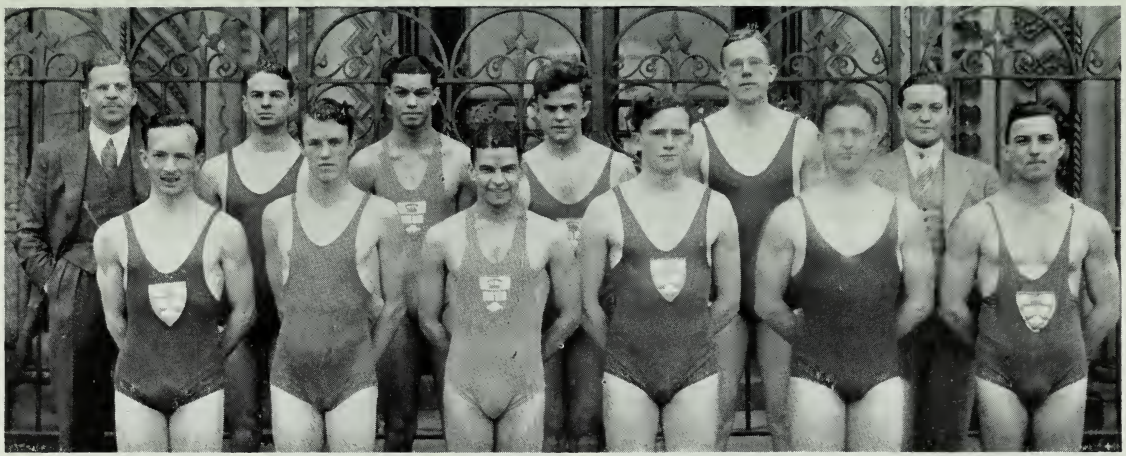
We congratulate the Junior School team for reaching the finals, and the Victoria team for winning the championship.

The writer takes this opportunity to thank the team for their fine co-operation and wishes them the best of luck in their exams.

F. R. Adams,
*Manager.*

S.P.S. SENIOR WATER POLO TEAM

*Back Row:* C. C. Hoag, H. B. Charters, J. N. Lilley, V. Zachanko.
*Front Row.* R. A. Thompson, R. A. Boyle, F. R. Adams, H. J. P. Morgan, D. B. Bruce.



UNIVERSITY OF TORONTO SWIMMING TEAM
INTERCOLLEGIATE CHAMPIONS, 1934-35

*Back Row*: Mr. R. H. Lowndes (Coach), I. L. Jennings, C. A. McCatty, M. W. Murphy, D. B. Bruce (Manager).
*Front Row*: V. P. Collins, R. N. Dilworth, W. A. McCatty, G. Otter, G. W. Stratton, J. P. Hooper.

S.P.S. JUNIOR LACROSSE TEAM

Ralph Bates, Art Breaky, Wm. King, Russell Rule, Stewart Murray, Robt. Stroud, Wm. Atkinson, Gib. Wheaton, Bruce Ballagh, Ernie Brough, Graham Walkey.

## S.P.S. Swimming Team

School endeavoured to bring back to the Red School House the Fitzgerald trophy, emblematic of the Senior Interfaculty championship, but they were outnumbered and outclassed by that strong Trinity squad, which boasts six men of Intercollegiate calibre. However, School were able to annex second place.

The team was made up of only six men and for such a small number did exceedingly well. Eggert, Reider and Jennings started the meet off by placing second in the 300-yard medley relay. C. Eggert showed why he is intercollegiate champion by taking first place in the diving. I. Jennings then swam the best race of the night to win the 200-yard breat stroke and at the same time break the interfaculty record. B. Woods managed to take a third in this event. The relay team, composed of Eggert, Reider, Otter and Hooper, completed the scoring for School by placing second in the 200-yard relay.

We trust that next year we will see a much larger turnout for swimming and thus make it a team meet instead of an individual meet.

J. P. Hooper,
*Manager.*

## Junior School Lacrosse

Junior School were successful this year in bringing the Dafoe Cup to S.P.S. for the first time since interfaculty lacrosse was commenced four years ago.

Junior School were grouped with O.C.E. and Forestry and experienced little difficulty in winning their group without a single defeat but more than doubling the score in each game.

During the season several exhibition games were arranged with several other colleges and collegiate teams in the city. Junior School were able in every case to turn in a win, often with quite a margin.

Having drawn a bye into the finals, Junior School played Victoria in a two-game series, total goals to count. In the first game School were able to gain a two-goal lead, but in the second game Victoria evened up the series and a third game was necessary. In this third hectic battle, Junior School once more hit their stride and when the final whistle was blown they had won the coveted Dafoe Cup.

Ralph Bates,
*Manager.*

S.P.S. SENIOR LACROSSE TEAM

*Left to Right:* JACK MCMILLAN, (Coach) J. LILLEY, P. GOOCH, H. CHARTERS, C. MARTIN, H. HAMILTON (Manager), R. BOYLE, A. JACOB, R. BRUCE, F. TAYLOR, M. GILPIN.

## Senior School Lacrosse

At last and for the first time the initials "S.P.S." are engraved on the Dafoe Cup; congratulations are certainly due the Junior School lacrosse team for the magnificent effort they made in winning the cup.

This year's Senior School team was in there fighting all the time, but lacked the finish and stick-handling ability necessary for a championship aggregation. Nevertheless a stout game was put up by the School lads and Meds., and Vic certainly knew they had been in a game when it was all over.

The first game with Meds. ended in a tie when the Docs scored a fluky goal with less than a minute to play to make the score 5-5.

Vic ran wild over the boys in the next game to pile up a 6-0 score. That one hurt!

Once more our traditional rivals, the Medicals, came into the picture and after a heavy checking, knock-'em-down and pick-'em-up style of game, another tie was chalked up; 6-6 this time.

With a group tie in the offing, the last game with Victoria was a red-hot set-to. Al Jacob scored three goals in this contest, but that wasn't enough. Vic won the game 12-9 and also the group title.

Corley Martin played a stellar game in goal in spite of never having played previously. Al Jacob our high scorer, John Lilley, Harvey Charters, Pete Gooch, Frank Taylor and Mike Gilpin were the forwards, and Ron Bruce, Ron Boyle and Hamilton played on the defence.

Thanks are due Jack McMillan for turning out to coach the team.

B. J. F. Hamilton,
*Manager.*

## Senior School Baseball

This year, as ever before, School was represented in the Senior Indoor Baseball League by a capable group of players. Although the fielding displayed by the team as a whole left just a little to be desired on occasions; still, when it came to punching out the precious base hits, they were always dangerous.

This point was clearly demonstrated in the opening game against Pharmacy, when School drove out eighteen hits to take a 15 to 2 win. In the next game, playing against Dents, last year's

S.P.S. SENIOR BASEBALL TEAM

*Back Row* (Left to Right): Mills, Hawker, Young, Miller, McLaughlin, Norwood, Bruce.
*Front Row* (Left to Right): Dembitzky, Sweet, Smith, Troster, Junker, Silver.

champions, the whole team encountered a wild spell, and although hitting well, found themselves on the short end of a 13-3 score at the close of the contest. Opposition in the third game was provided by Pharmacy, and this very much improved team took advantage of an early-innings School batting slump, and pulled out a 9 to 5 victory. At this stage of the schedule, with Dents still undefeated, School found themselves eliminated from further contention, and once again any hopes of gaining possession of the Spalding Cup faded from view—for this year at least.

Members of the team were as follows: Fred Sweet, catcher; Aubrey McLaughlin, Tom Dembitzky and Phil Hawker, pitchers, the latter holding down first base, along with Blake Young; Jack Troster, Don Cook, Bob Junker, and Dick Miller, at infield positions, while outfield duties were looked after by Syd Silver and Roy Smith.

As mentioned before, every member of this team was a better than average hitter, but temporary lapses in defence proved to be the weak factor. However, as five of these men are third year students, School's outlook for Senior baseball next season appears to be quite promising.

George W. Mills,
*Manager.*

## Junior School Baseball

As last year's manager predicted, Junior School produced a good team this season and won their group after playing to a tie with Junior Meds. However, in a second game, Jr. Meds. were taken care of to the tune of 16-4 and Jr. S.P.S. advanced to the group play-down.

The semi-finals came out with O.C.E. on top and Dents, Victoria, and Jr. School tie for second place. Unfortunately at the time of going to press the outcome of this play-off is not known, but as the team has been improving every time out they can be relied on to make a good showing.

The batting strength of the team was better than usual this year with Pidduck, Cherofsky and Willmott heading the list. McMillin did mots of the pitching with Busby catching. The infield consisted of B. King, Willmot and Marks with Cherofsky and A. King in the short-stop positions. Pidduck and Jaffe held down the fielding posts.

During the entire schedule the team fought hard and always displayed good sportsmanship. However, if the Spalding Cup does not come to S.P.S. this year, the Sr. team next season will be a real contender for the honours with practically every member of the Jr. team moving up to the Senior squad.

R. L. Clark,
*Manager.*


S.P.S. JUNIOR BASEBALL TEAM, 1935

*Back Row:* A. E. King, W. J. King, J. P. McMillan.
*Middle Row:* A. C. Rogers, B. Marks, B. Chernofsky, D. G. Willmot.
*Front Row:* K. R. Busby, F. P. Mundy, J. B. Jaffe, C. D. Pidduck, R. L. Clark.

S.P.S. JUNIOR HOCKEY TEAM, 1935

*Left to Right:* Elliott (Manager), Ballagh (Defence), Breakey (Centre), King (Defence), Upper (Defence), Smith (Right Wing), Walton (Right Wing), Hemphill (Goal), Clements (Left Wing), Hamer (Centre), Woods (Left Wing), Stroud (Goal).

S.P.S. SENIOR HOCKEY TEAM, 1935

*Back Row:* W. R. Smith (Left Wing), R. Hewitt (Defence), G. A. Aitken (Defence), H. McNichol (Centre), G. R. Davidson (Right Wing), A. B. Stothart (Defence), R. Thompson (Coach).
*Front Row:* J. C. Stavert (Right Wing), H. B. Paterson (Left Wing, Manager), B. L. Young (Goal), H. M. Kerr (Left Wing). J. P. Hodgson (Centre).

## Junior School Hockey Team

The Junior School team, while not entering the play-offs, showed a great deal of promise and the hockey future at School looks very bright.

The first game against Jr. Meds. resulted in a 1-1 tie. Against the strong Vic team, School came out on the short end of the score. Wycliffe and Emanuel offered no trouble at all to the fast School team and two wins resulted out of these encounters. The season ended when Trinity presented School with their second loss. School had much the better of this game, but erratic shooting does not score goals.

To pick individual stars would be difficult, but Upper and King on the defence and Hamer and Woods on the first string forward line deserve special mention. Hemphill in goal made many brilliant saves and was always a tower of strength.

If this year's team can be taken as a criterion of the coming School hockey teams the Jennings Cup will be back with us soon.

J. Elliott,
*Manager.*

## Senior School Hockey

Represented by a well-balanced team with more than average hockey ability, Sr. School, after six hard fought games, gained a position in the play-offs for the Jennings Cup.

By the score of 6 to 2, School eliminated Pharmacy in the first of the play-offs after two games, and next came up against their old rival, Victoria, in the semi-finals. After losing the first game by 4 to 2, Sr. School put up a wonderful exhibition of hockey to win the second game by 3 to 2, but were one goal down on the round. The team was certainly out-lucked in this series with Vic as, on their showing, they deserved a better result. However, goals count, not excuses.

In goal, Young played a cool, steady game. He was ably protected by Aitken, Stothart and Hewitt on defence, Hewitt making some fine rushes as well. The hard-skating forward line of Kerr, Stavert and Hodgson stood out at all times with their rushing attacks and brilliant back-checking. McNichol, Davidson and Paterson on the other forward line produced some excellent plays, with the desired result more than once.

Two Schoolmen, Thompson and Smith, supplied the "School Spirit" by not missing a game during the schedule and helped out at many a game, their services being appreciated.

H. B. Paterson,
*Manager.*

S.P.S. SOCCER TEAM, 1934-35
INTERFACULTY CHAMPIONS, 1934-35

*Back Row:* Woods, Mitchell, Moore.
*Second Row:* Prof. Allcut (Honorary Coach), Davey, Tuke, Bowen (Captain), Kearney, Marks, Mr. Ward (Coach).
*Front Row:* Johnston, Shamandurov, Brawley, Fraser (Manager), Jaffe, Self.

# School Soccer

With the opening of the season it was evident that the team of the previous year, with one or two exceptions, was almost intact. A good turnout of Freshmen enabled us to round out a team which ultimately won the Arts Faculty Cup. During the two weeks before our opening game, the team practised most diligently and were in excellent shape for the first game. Professor Allcut and Matt Ward gave us several chalk talks and suggestions which were of very great assistance to all.

Our group consisted of School, Dents, and Pharmacy. In the opening game, which we won from Dents 4-0, the team surpassed all expectations. A team-play was demonstrated which was a pleasure to watch and also a scoring punch which has not been evident in School teams for several years. Our next game was not up to the standard of the first one. The boys seemed over-anxious and the result was we had to be content with a 0-0 tie with Pharmacy. Dents fell before our onslaught once again, this time to the tune of 1-0. There was a possibility before our last game, that Pharmacy could tie us for the group. However, we decided the issue by capturing the verdict from Pharmacy 2-0.

In the play-offs, which began shortly after the completion of the schedule, we were entered against Victoria College and University College. We drew the bye into the finals and Victoria defeated University College, thus winning the right to meet us. We started well in the first game but faded badly in the second half to lose the verdict 2-1. In the return game we played excellently and after a fierce struggle won the game 3-1 and the round 4-3. This game was the prettiest exhibition of soccer seen on the campus for some time. With the winning of this game and the round, the Arts Faculty Cup came to School for the first time in thirteen years.

W. C. G. Fraser,
*Manager.*

# S P.S. Gym Team

For the second time in succession the S.P.S. gymnastic team was defeated in the Interfaculty meet, which was held at Hart House two weeks before the Intercollegiate meet. This time the winners of the Harold A. Wilson Trophy was Trinity, who, unfortunately for S.P.S., nosed out a very narrow margin to win the meet. However, in the year to come, it is almost a sure bet that Science will once more prove victorious in the gymnastic field. I would like to urge all the recruits and all the freshmen who are interested in the sport to be out with us for coming season.

The members of our team this year, who were forced to bow to Trinity, are all experienced in the game, both A. B. Lewis and G. F. Bears are Provincial medal holders, the third member, and the big "boy" of the team is M. L. Sherwood. All three of these have competed in the Intercollegiate competitions for the Varsity team.

Geo. F. Beard,
*Manager.*


S.P.S. GYM TEAM

*Left to Right:* B. Lewis, M. L. Sherwood, G. F. Beard.

# C.O.T.C.

Officers Training Corps have been established throughout the Empire for the purpose of giving to men of University standing, who naturally take an intelligent and active interest in national affairs, and are best fitted to become leaders in cases of emergency, whether civic, national or international, a standardized course of training and experience in the organization and control of large bodies of men for the carrying out of definite projects, and in the ability to appreciate and successfully meet various situations as they may arise. In this way a reserve of officers trained in fundamentals and general principles is kept available in case of a national emergency.

While officers and soldiers can be trained in matters of routine duties and drill in a very few weeks, the training of officers in leadership and in sound judgment can not be hurried.

In this connection the following quotation from the editorial page of the Toronto Globe of 6th March, 1935, under the caption—"*Britain Forced to Re-arm*", gives us food for thought.

"Britain's endeavour to give a lead in the reduction of armaments is recalled in the White Paper, but it is a deed that the Government has become convinced that the existing machinery for maintenance of peace can no longer 'be relied on as protection against an aggressor'. It is added:

"In the above circumstances the Government felt that they would be failing in their responsibilities if, while continuing to the full the efforts for peace by limitation of armaments, they delayed the initiation of steps to put their own armaments on a footing to safeguard us against potential dangers.

"Against repeated discouragements, Great Britain has persisted in her efforts in the cause of disarmament, but with militarism on the Continent still brandishing the steel fist the necessity for more adequate defence measures has become clear."

The University of Toronto Contingent was organized as such shortly after the outbreak of the Great War; although it may logically be considered as the grandchild of "K" (University) Company, 2nd Canadian Regiment, Queen's Own Rifles, which took a notable part in the North-West Rebellion in 1885.

The first Commanding Officer of this Contingent was the late Col. (Prof.) W. R. Lang. During the war more than 1,500 officers were trained in this unit for the Allied Forces.

On the death of Col. Lang in 1925, Lt.-Col. (Prof.) T. R. Loudon, V.D., took command, and was succeeded by Lt.-Col. (Prof.) J. R. Cockburn, M.C., V.D., in 1931, at which time the present organization for training was adopted, providing for various branches of the service. For example, in "C" Company, instruction and training are given in certain technical arms of the service which are restricted to Engineering students and graduates only.

Although the University Calendar briefly outlines the C.O.T.C., the possible benefits to be gained by students in this organization are not set forth in detail. The physical exercise obtained in these courses of training is accepted by the University in lieu of that given in the gymnasium; also most of the course is carried on during the time-table periods allotted to physical training.

Officers Training Corps provide training leading to certificates of qualification for the ranks of lieutenant and captain in military forces of all parts of the British Empire. This is the only avenue through which such qualifications can be obtained without being commissioned as an officer in the military forces.

Although this contingent is a unit in the active militia of Canada, members other than officers are given their discharge upon completion of their courses in whole or in part, and are no more liable to be called on active service than the "man-in-the-street".

"C" Company of this contingent, composed of Engineering students and graduates, while offering instruction in infantry and cavalry for those desiring same, concentrates on training in the scientific arms of the service, including artillery, survey, engineering, signalling, etc., in which specific training is given in the application of science to practical problems, the actual use of engineering materials and quick or empirical methods of design, etc., in a manner which constitutes a most valuable parallel to the Engineering Courses in the University. Preliminary training is also given to those students having ambitions toward the air forces. These are in addition to the broad general training mentioned above.

Naturally the cost to the Government of such courses given free of charge together with pay of the members of the contingent is considerable; but to quote further from the above mentioned editorial page: "An armed peace comes high, but for the present that seems to be the only kind that is in sight".

## The Rifle Association

This year the membership of the University Rifle Association surpassed all records. On looking back to the Transactions of 1933, we find the Rifle Association representative boasting of a membership of 90, the highest since the war. All we can say is that they didn't tell the boys about the shooting or perhaps they just didn't know how to sell memberships. This year our membership is 155 and they all joined of their own accord too. It goes without saying, —School is well represented.

Last fall we got an early start at the outdoor shooting and those in charge of Long Branch ranges thought Toronto Garrison had just arrived the first day we went out. We skipped the odd lab and took Saturday afternoons off to learn which end of the rifle to point at the target and prepare for the Interfaculty match which was held on October 27th.

S.P.S. RIFLE TEAM

*Back Row*: A. H. Houle, J. E. Lee, F. B. Pickett, A. S. Foreman, N. R. Tutton.
*Front Row*: S. M. Rothman, R. L. Broad, M. D. Bleaken.

It seems it had been the custom for the past couple of years for Dean DeLury to present the DeLury Shield to the Arts team as the outdoor champions. Of course a thing like that just couldn't go on so the Engineers came right out on the match day to remedy the situation. When the smoke had cleared away and all the scores added up, S.P.S. had done such a good job of it that Arts were only runners up and Dents were in second place. The scores were S.P.S. 333, Dents 324, Arts 314, and Pharmacy 310, out of a possible 350.

An extra series match was held on the same day for which cash prizes were given. School, of course, took most of the money. The top three men for the day's match were J. E. Lee, 1, S.P.S., A. S. Foreman, 2, S.P.S. and A. H. Houle, 3, S.P.S.

It was decided to hold a banquet during the week after the match. At this banquet the boys received their prizes for the outdoor shooting and consumed all the groceries and cigarettes in sight. Colonel Utton of the Canadian Bisley team gave a very interesting talk on "How to Become a Good Shot".

In the indoor Interfaculty match, the Engineers put it over again, and the Mitchell Cup, presented to the Rifle Association by Dean Mitchell for indoor Interfaculty competition, will remain in the Engineering Society for the fourth consecutive year.

The scores were School 971, and Arts 946 out of a possible 1,000.

The individual aggregate scores were keenly contested in view of the increased prize list. The three highest were R. L. Broad, III S.P.S. 518, R. A. Sharpe, I Arts, 516, and J. E. Lee, I S.P.S., 506, out of a possible 525.

A number of the Association members entered the Dominion Marksman Competition held by Canadian Industries, Limited, and all were successful in winning at least one medal. These medals will be presented at the Annual Banquet on March 19th, along with the other prizes.

The team of six men representing the University in competition in the city are R. L. Broad, S.P.S., captain, F. B. Pickett, S.P.S., S. M. Rothman, S.P.S., J. E. Lee, S.P.S., Dr. Lucas, Graduate, and R. A. Sharpe, Arts. Schoolmen are there again!

To those of the incoming year and any others interested, we may say that you will find a warm welcome and a lot of fun awaiting you in the Rifle Association.

R. L. Broad.

# UNIVERSITY OF TORONTO ENGINEERING SOCIETY

## BALANCE SHEET

### AS AT MARCH 31st, 1935

#### ASSETS

| | | |
|---|---|---|
| **Current Assets** | | |
| Cash on Hand | $ 75.52 | |
| Bank Balances—Savings | 2,222.49 | |
| Accounts Receivable | 598.13 | |
| Suspense—Returned Cheques | 8.00 | |
| Merchandise Inventory | 2,447.59 | |
| | | $ 5,351.73 |
| **Investments** | | |
| Dominion Government and Government Guaranteed Bonds | 4,000.00 | |
| Add Accrued Interest | 91.17 | |
| | | 4,091.17 |
| **Fixed Assets** | | |
| Office Equipment | 1,288.57 | |
| Less Reserve for Depreciation | 864.86 | |
| | | 423.71 |
| **Deferred Expense** | | |
| Unexpired Insurance | | 26.66 |
| | | $ 9,893.27 |

#### LIABILITIES AND SURPLUS

| | | |
|---|---|---|
| **Current Liabilities** | | |
| Accounts Payable | $1,301.00 | |
| Bank Overdraft—Current Account | 320.96 | |
| | | $ 1,621.96 |
| Surplus Account | | 8,271.31 |
| | | $ 9,893.27 |

## OPERATING STATEMENT SUPPLY DEPARTMENT

### APRIL 1st, 1934 TO MARCH 31st, 1935

| | | |
|---|---|---|
| Sales | | $11,018.21 |
| Inventory, 1st April, 1934 | $2,328.11 | |
| Purchases | 8,220.41 | |
| | 10,548.52 | |
| Less Inventory, 31st March, 1935 | 2,447.59 | |
| Cost of Goods Sold | | 8,100.93 |
| Gross Trading Profit | | 2,917.28 |
| Regular Salaries | 1,365.00 | |
| Extra Assistance | 225.50 | |
| | | 1,590.50 |
| Net Operating Profit | | $ 1,326.78 |

# UNIVERSITY OF TORONTO ENGINEERING SOCIETY

## STATEMENT OF INCOME AND EXPENDITURE

### APRIL 1st, 1934 TO MARCH 31st, 1935

| | | |
|---|---|---|
| Net Operating Profit from Supply Department | $1,326.78 | |
| Fees | 1,590.00 | |
| Interest and Discount | 200.21 | |
| School Night Supplies | | |
| School Formal | 8.92 | |
| | | $ 3,125.91 |

GENERAL OPERATING EXPENSES

| | | |
|---|---|---|
| General Expenses | $ 367.25 | |
| Grants to Affiliated Clubs and Scholarship | 279.50 | |
| Donations | 125.46 | |
| Dinner—Deficit | 266.26 | |
| Election Expenses | 148.06 | |
| School Formal | | |
| School Nite | 116.96 | |
| Photographs | 320.80 | |
| Publications | 724.84 | |
| Depreciation—Office Equipment | 92.43 | |
| Insurance | 18.34 | |
| Printing and Stationery | | |
| | | $ 2,459.90 |
| Excess of Income over Expenditure to Surplus Account | | 666.01 |
| | | $ 3,125.91 |

SURPLUS ACCOUNT—APRIL 1st, 1934, TO MARCH 31st, 1935

| | | |
|---|---|---|
| Balance 1st April, 1934 | | $ 8,438.30 |
| Publications 1933 Account | | |
| Excess of Income over Expenditure for year ending 31st March, 1935 | | 666.01 |
| At Home 1933 Account | $ | |
| Adjustment of Bad Debt Reserve | | |
| Dividend on Fees | 833.00 | |
| Balance to Balance Sheet | 8,271.31 | |
| | $9,104.31 | $ 9,104.31 |

« Autographs »